

SERVICE MANUAL

MODEL "STW"

FRIDEN

CALCULATING MACHINE CO., INC

HOME OFFICE AND PLANT - SAN LEANDRO, CALIFORNIA
SALES AND SERVICE THROUGHOUT THE WORLD

PREFACE

The following information on Basic and Sectional Adjustments has been prepared to give a more vivid and thorough understanding of the Friden Calculating Machine.

The first section of the manual deals with the major phases of mechanical operation of the machine. It is provided so you may better understand the mechanical processes involved in the operation of a mechanical calculating machine. There are a number of operations illustrated to give you a better idea of how it works.

The second section of the manual lists the most important adjustments, settings, timing, etc., and how they are made. There is also a list of Service Problems and what to check in order to correct errors, mechanical failures, etc.

This manual deals with the current models and for the most part, the adjustments contained herein may be applied to past models as well.

Friden Calculators are well designed and accurately manufactured. A properly adjusted and serviced machine will give years of satisfactory service.

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anything compared to the DIVIDENDS it PAYS

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SERVICE RULES TO REMEMBER

1. The customer is our employer; treat him right, protect his property and respect his rights.
2. Conduct yourself as becomes a member of the FRIDEN FAMILY.
3. Promote the name FRIDEN by leaving the customer happy that you have called on him.
4. Improve your WORK REPUTATION by making every job you do your masterpiece.
5. When working on a machine, make sure all screws are tight. Never leave a screw loose to take care of a binding part; if a part binds, find out why and correct it. Loose screws can cause you an unnecessary amount of trouble. Tighten screws when assembled and you won't forget them.
6. Take time to thoroughly check over a machine if there is the least doubt of a possible error.
7. IMPORTANT: Read and study the adjustments in this manual very carefully and follow instructions closely. Corrections may be made more easily and accurately if the sequences and instructions are followed to the letter.

HOW TO USE YOUR MANUAL

The adjustments in this manual are listed beginning with the Basic Machine and progressing through the various Automatic and Special Features. For the most part, these adjustments are shown in the sequence in which they should be made or checked.

Parts numbers of parts shown in these adjustments have purposely been eliminated and letters substituted. The reason for this is that whereas parts may be changed and the numbers changed, the adjustments of those parts do not materially change.

The Arrows shown on the parts indicate the part is out of Home Position or in motion. These are Motion Arrows. The Arrows beside the Adjustment Point indicate direction in which adjustment may be made; thus a single Arrow indicates adjustment is made in one direction only. Two Horizontal Arrows means right, left, forward or rearward. Two Vertical Arrows means up or down. Combinations of these Arrows mean up and to the right, down and to the left, etc. These are Adjustment Arrows.

RULE OF ECCENTRICS: Except where specifically noted, all Eccentrics should be positioned as shown in the sketches showing their adjustment. In many cases, the parts adjusted by Eccentric will not operate properly if the Eccentric is in any other position than the one shown.

Definition of terms used:

HOME POSITION: The machine is not in operation, and the parts are in their normal stationary position.

NORMAL POSITION: Machine may be in operation but certain parts, such as the Multiplier Section, etc., are not in operation.

RIGHT: Toward the Right Side Frame Assembly.

LEFT: Toward the Left Side Frame Assembly.

For example: If you are facing the rear of the machine, LEFT would be to your right. In all cases where reference is made to RIGHT or LEFT in this manual it means toward the Right Side Frame or toward the Left Side Frame.

When making changes in adjustments, hold clearances to the tolerances given. These adjustments have been worked out over a period of time and have been found to be satisfactory for most efficient operation of the machine. However, DO NOT change adjustments found in the machine without good cause.

HOW THE MACHINE WORKS

To better your performance as a Friden Serviceman, it is well to know all the functions of the machine you are working with. Taken as a whole, the machine looks complicated when looking at it as a complete machine. The mystery of the Friden Calculating Machine's operation becomes simplified when its various performances are broken down to the individual parts involved.

Each and every part, screw, link, stud and spring in the machine has a definite job to do; and when the functions of these parts become known to you, much of the mystery disappears. A little time for study of your machine each day will pay big dividends in your being able to overcome service problems more quickly and efficiently.

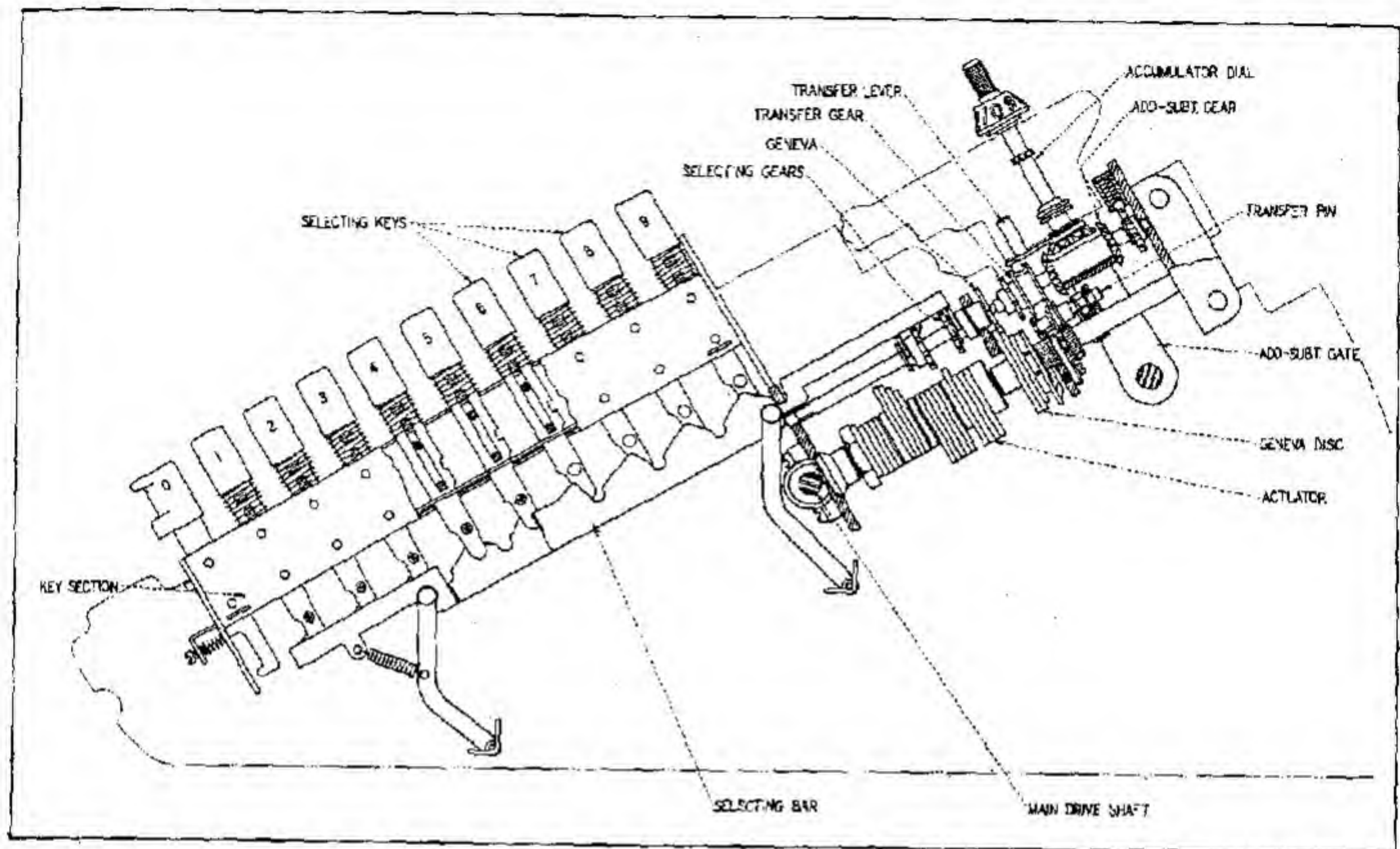
You, as a Serviceman, are not particularly interested in the more involved applications of the Machine - this is the Salesman's territory, but you definitely should know what all the Keys and Controls are intended to do and how they operate. Learn to operate the machine so you may better test it after corrections have been made and know that it operates accurately.

When you have learned to operate a Friden Calculator, learn how each operation is accomplished mechanically by tracing out all the parts involved in that operation; learn what each part contributes to the successful completion of the operation. When a machine fails or errors occur, it is usually due to some part or combination of parts failing to do what they should do. This may be caused by wear, a loosened screw, a disconnected or broken spring, or any one of a number of things that may happen to parts.

If you know the parts in the operation which failed, it is relatively easy to trace the operation through and locate the offending member. Quite often, more than half the time for repairing a machine is in locating the source of trouble. Diagnosis of machine troubles is a skill that can be acquired only through study of the machine, the Service Manuals and through much experience.

The following pages of this Service Manual are for the purpose of acquainting you with some of the more basic operations of the Friden Calculating Machine. As you study each drawing, follow out the operation on a machine. For example, see for yourself what takes place when a numeral key is depressed in the Main Key Board. Note that, as the key goes down, the Key Lockbar engages a notch in the Keystem to hold it down; the stud on the bottom of the Keystem slides along an incline on the Selecting Bar, moving it toward the front of the machine and positioning the Selecting Gear to the proper Segment on the Actuator. This illustration is very elementary, it is true; but remember, every operation in the machine becomes elementary when taken in small doses.

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HOW THE MACHINE WORKS



A. ROTO-FLOW DRIVE: The principle of the Roto-Flow Drive in the Friden Calculating Machine is that all the main rotating parts in the machine revolve in ONE DIRECTION at all times, whether the operation be Addition, Subtraction or Shifting the Carriage to Right or Left. This principle of Drive goes far to simplify the Calculating Mechanism and especially the Transfer Mechanism. Since the rotating parts of the machine always revolve in one direction, only one set of Transfer Gears and Levers is necessary. In the process of switching from Addition to Subtraction, only the Accumulator Dials are reversed.

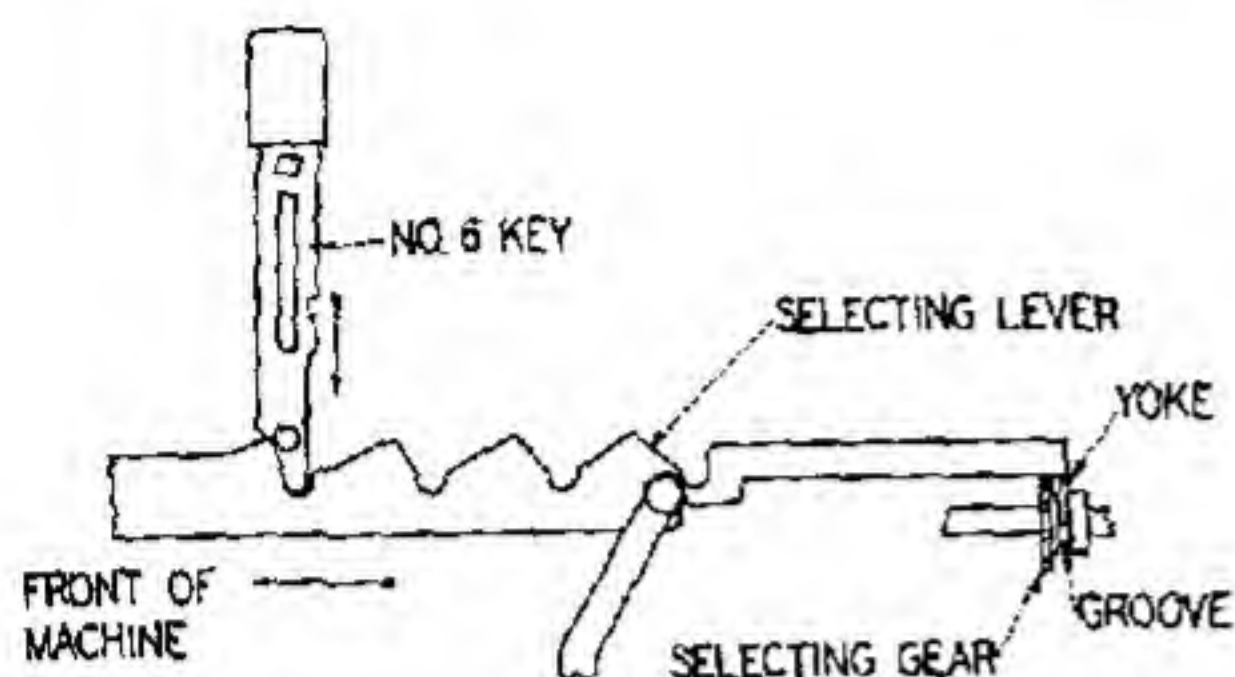
This action is accomplished through the action of the Add and Subtract Gear, which, in reality, is two gears on one hub. The Product Dial Gear is located between these two Gears. The Add and Subtract Gear slides on the Add and Subtract Gear Shaft. Thus, when the front part of this Gear engages the Product Dial Gear, the result is ADDITION; and when the Rear part engages, the result is SUBTRACTION. The Add and Subtract Gear always rotates in the same direction, but the Accumulator Dial Gear will rotate in either direction, depending upon whether it is in mesh with the Front Gear or Rear Gear.

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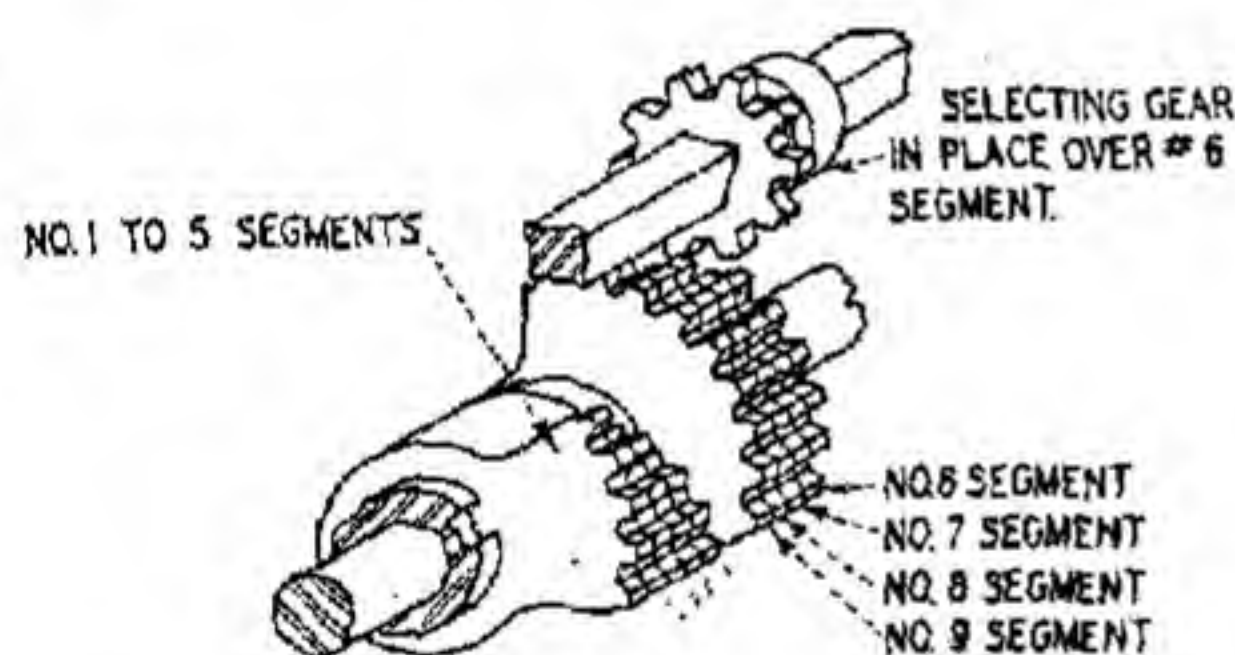
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HOW THE MACHINE WORKS

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B. SELECTION - MAIN KEY BOARD: Study the above illustration with a machine uncovered. Depress the number 6 Numeral Key; watch the action which takes place as the Key is traveling downward. Note the Key Lockbar slip into the notch in the Keystem. The Lockbar is out of sight inside the Keybox, but its movement can be seen at the front end of the Keybox. Note the movement of the Selecting Bar as it moves toward the front of the machine and pulls the Selecting Gear along with it.



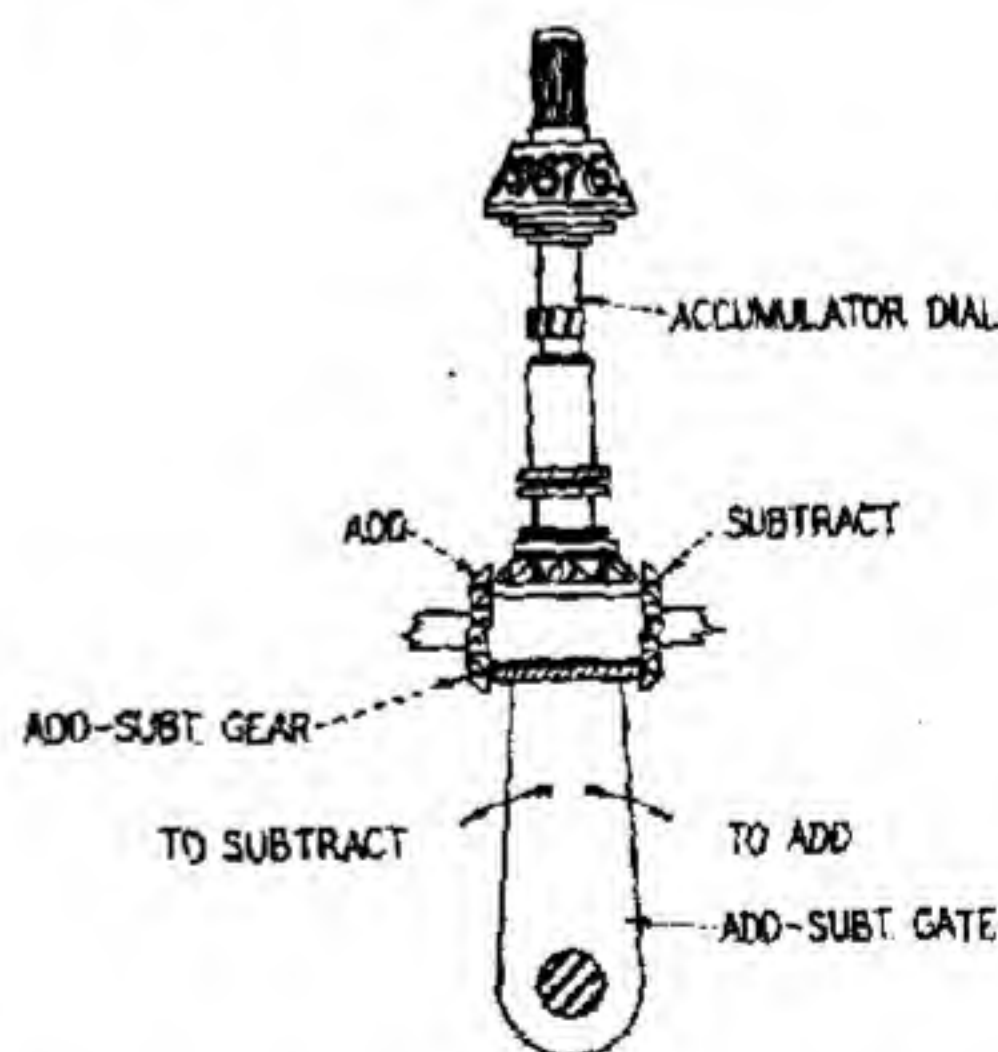
C. You will see that this action has placed the Selecting Gear in line with the Number 6 Segment on the Actuator. Now, if the Plus Bar is depressed and the machine operated, a 6 will appear in the Upper or Accumulator Dial directly in line with the Numeral 6 Key in the Main Key Board.

Release the 6 in the Main Key Board with the Zero Key at the bottom of the column in which the 6 is located. Note how the Zero Key moves the Key Lockbar rearward to release the Numeral Key and the action of the Spring under the 6 Key lifts it upward to restore it to its normally clear position. Repeat the above operations on other Numeral Keys; note that a 5 or a 9 Key moves the Selecting Bar a greater distance than a 1 or 6 Key. See the reason for this in the arrangement of the Segments on the Actuators.

CARRIAGE: The movable Carriage on the Friden Calculating Machine gives us a means of changing the value of any number or figure placed in the Main Key Board by simply shifting the Car-

riage to the right or left, depending on whether it is desired to increase or decrease the value of the Key Board Factor. Thus, with the figure 1 in the first column of the Main Key Board and the Carriage in the first position or extreme left, the figure 1 is then in the UNITS place and has the value of 1. Shift the Carriage one place to the right and the 1 is then in the TENS place and has the value of 10; third Carriage position, 100, etc. Thus, the value of the Key Board Factor is INCREASED by shifting the Carriage to the RIGHT and would naturally be DECREASED by shifting the Carriage to the LEFT.

BASIC OPERATIONS: ADDITION and SUBTRACTION are the two main Basic Operations of any computing machine. All the "Useful Answers" used in mechanical calculation are obtained by one or a combination of both of these basic functions of arithmetic. Thus, multiplication becomes a process of ADDING a number (the multiplicand) to itself a given number of times (the multiplier) to obtain a result (the product). Division is a process of SUBTRACTING a given number (the divisor) from another number (the dividend) a number of times to obtain a result (the quotient); and sometimes part of the dividend is left over and this is called the remainder. Thus, you see that all arithmetical processes make use of one or both of these Basic Operations.



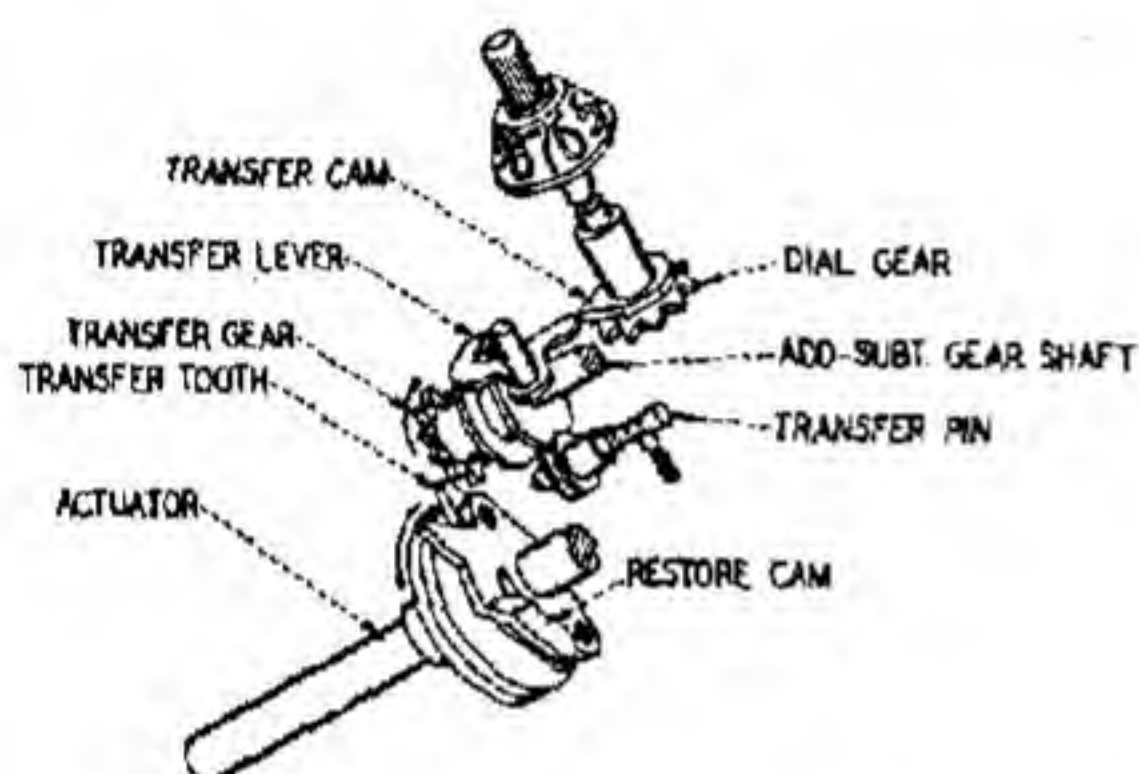
D. ACCUMULATION: Accumulation of numbers in calculations is the adding of one number to another or adding a series of numbers together. This accumulation gives us a total which is desired when it is necessary to determine the amount occasioned when two or more numbers are added together; thus, the accumulation of 2 and 2 becomes 4, etc.

In the Friden Calculating Machine, this process of accumulation is performed mechanically by the medium of gears and dials. As a demonstra-

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HOW THE MACHINE WORKS

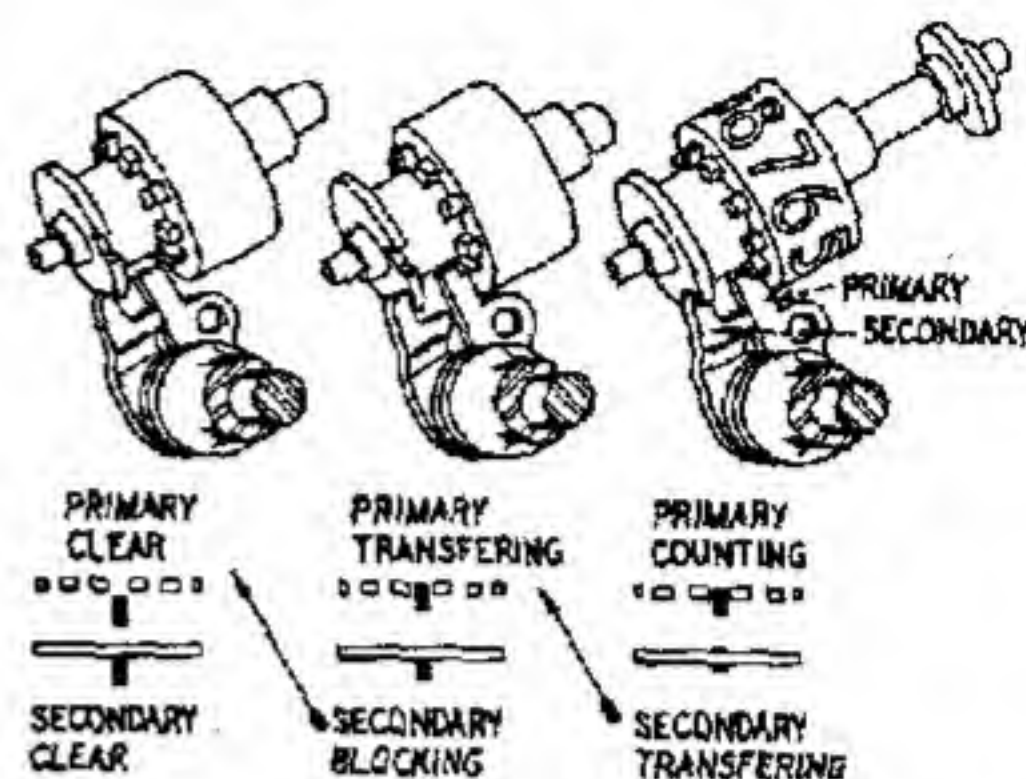
tion of this process, put the number 125 in the Main Key Board, depress the Plus Bar and turn the Drive Shaft slowly by handcrank. Note as the revolution of the Drive Shaft progresses, the number 125 appears in the Accumulator Dials. With the same number in the Key Board, again depress the Plus Bar and rotate the Drive Shaft by handcrank and the number 250 appears in the Accumulator Dials. Why did not the number 2410 appear? This last demonstration brought into play another feature of Accumulation known as Transfer. Thus, when the 5 and 5 were added together the 1 of the result 10 was automatically transferred to the second column and added to the 4 in that column so that it became 5, and the correct result 250 appeared in the Accumulator Dials.



E. TRANSFER: The Transfer mentioned above is accomplished by the action of a Cam on the bottom of the Accumulator Dial Shaft and is located just above the Accumulator Dial Gear. This Cam actuates the Transfer Lever, which in turn moves a Transfer Gear downward on the Add-Subtract Gear Shaft next order to the Left. This action moves the Transfer Gear into position to be acted upon by the Transfer Tooth on the Actuator which rotates the Transfer Gear one tooth, and in turn causes the Accumulator Dial to register an additional digit. All this action takes place after the rotation of the Selecting Gear is completed in that column; so there is never any interference between Selection and Transfer. The Transfer Gear is restored to normal position by the Restore Cam on the Actuator.

You will note that numbers continue to accumulate in the Upper or Accumulator Dials until the end of the operation being performed. These numbers will remain "stored" in the Accumulator Dials until cleared out or "erased" to begin the next operation.

F. COUNTER: The Counter in the Friden Calculating Machine is for the purpose of recording the number of calculations made in any one prob-

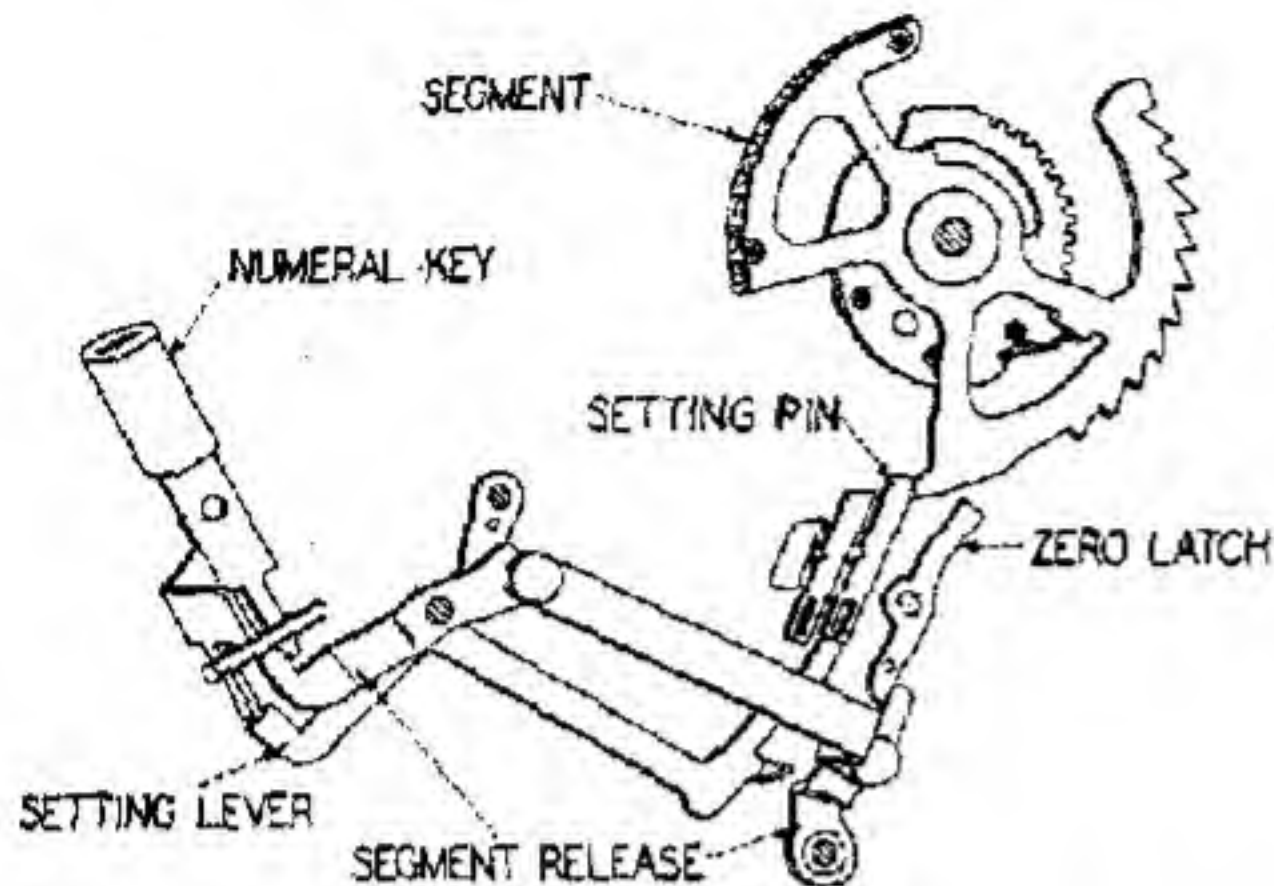


lem and/or accumulating the number of operations made in a series of calculations. The principal use of the Counter is in division problems where the number of calculations made by the machine is the quotient or answer. There are other uses for the Counter such as: checking for the correctness of multipliers, number of items in addition or subtraction, and other applications of the machine.

Observe the construction of the Counter, how the Teeth are assembled on the Counter Shaft and the slight amount of Spiral necessary to prevent errors in Transfer from one Counter Dial to another. Study the above drawing to note how this Spiral works in connection with the Blocking Cams on the Counter Dials so that only ONE Secondary Finger may touch a Blocking Cam at any one time, how the Secondary Finger moves into the Slot in the Blocking Cam to effect a Transfer. Study the Counter action in the machine.

DIVISION: In mechanical calculating machines, the process of division makes use of both subtraction and addition due to the mechanical process necessary to determine the difference in the size of the figures involved. That is to say, the machine will subtract one time too many in that particular column to determine that it is necessary to shift the Carriage into the next column where the process of subtraction will be continued until the completion of the problem. When this happens, the machine knows that it has made an overdraft and hastens to correct that overdraft by immediately adding the last subtraction back into the Upper Dials, after which the Carriage is automatically shifted into the next column to continue the operation. Therefore, in division, the machine is continually subtracting, adding and shifting the Carriage through the whole operation.

G. SELECTION - MULTIPLIER KEY BOARD: Study the next illustration. Depress the Numerical 1 Key, follow its action down through the Key Board to the Setting Lever and to the Setting Pin in the far rear position in the Setting Pin Board. Note that the Number 1 Pin is pushed upward.



Restore the Multiplier Unit to Normal by using the Multiplier Clear Key. Now depress the Numeral 1 Key and note the action of the Multiplier Segment Release Mechanism. Note that the Key-stem contacts a small rod inside the Key Board, which in turn transmits motion to the Segment Release Mechanism and to the Zero Latch so that it moves out from under the Selection Segment; the Segment actuated by a spring, is stopped by the Number 1 Pin.

Again restore the Multiplier Unit and depress the Numeral 1 Key; and note that the small rod inside the Key Board also actuates the Escapement Pawl downward until the Holding Pawl moves out of a Tooth in the Escapement Bracket. As the Key is released, the Multiplier Selection Unit is allowed to move to the left the space of one Tooth.

We have now completed the Selection of the Number 1 in the Multiplier Selection Unit. This places the Multiplier 1 in the first column of the Multiplier Unit. Depress the Numeral 2 and note that the Unit has now moved to the second position, and the first number selected has now been placed in the second column of the Multiplier. As each digit of the Multiplier is selected, the column position of the previous digits moves one space to the left. This is easily seen on a covered machine by noting the numeral on the Decimal Pointer Bar in line with the first number selected; thus, if you depress the 1 Key three times, the first 1 selected will be in line with the figure 3 on the Decimal Pointer Bar. Thus, when you select a Multiplier in the Multiplier Key Board, you would put it in as you would read it; that is, for the Multiplier 125, you would depress the 1, then the 2, and then the 5.

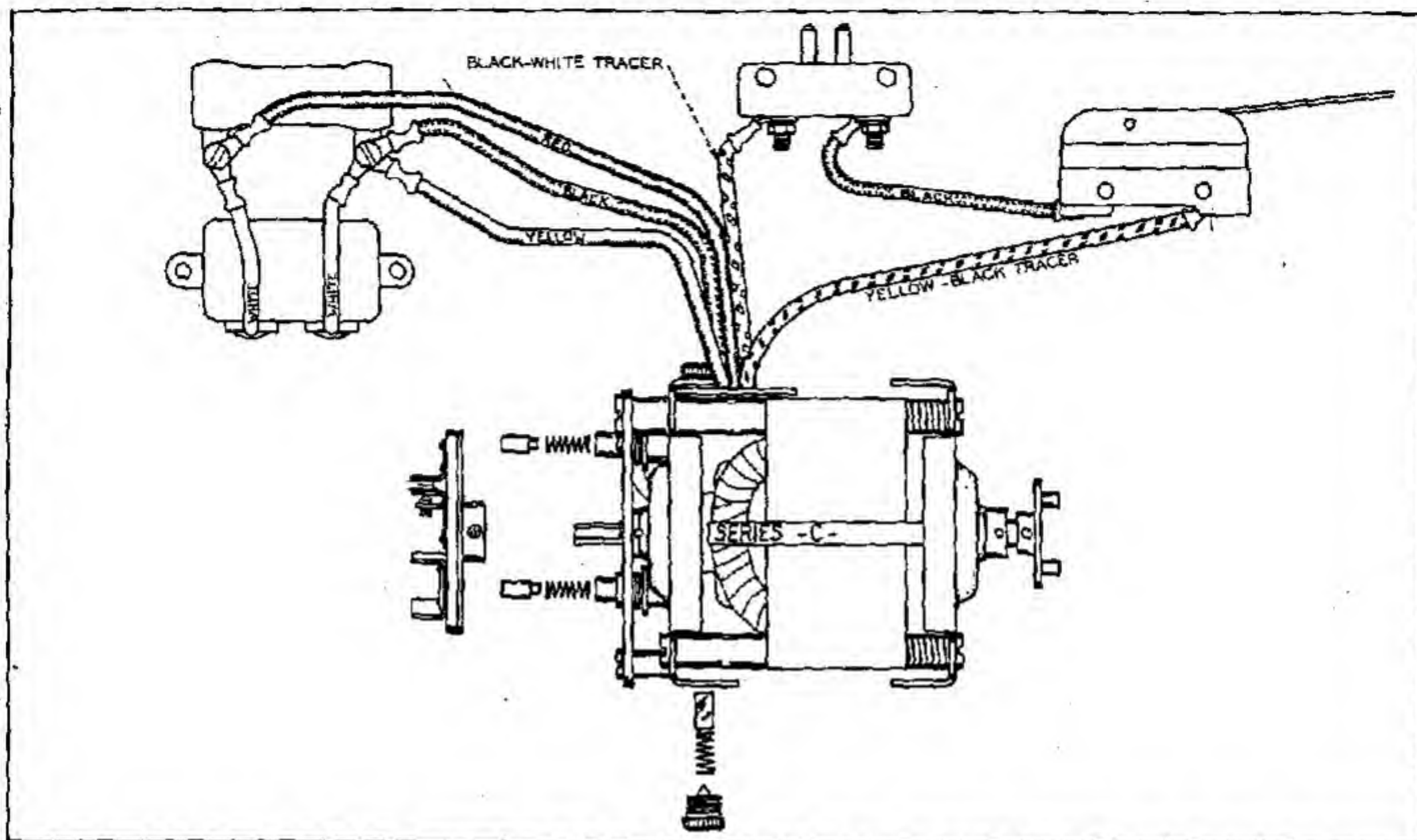
GENERAL: The foregoing descriptive drawings and text are merely an effort to start you on your way to a fuller understanding of the Friden Calculating Machine. Apply these principles to other

operations; trace these operations through the machine so you will KNOW what is taking place in your machine when any one of the Control Keys is depressed. After you have mastered this phase of the work, there should be little to bother you in making accurate diagnosis of machine troubles and locating the proper part or place to make correction.

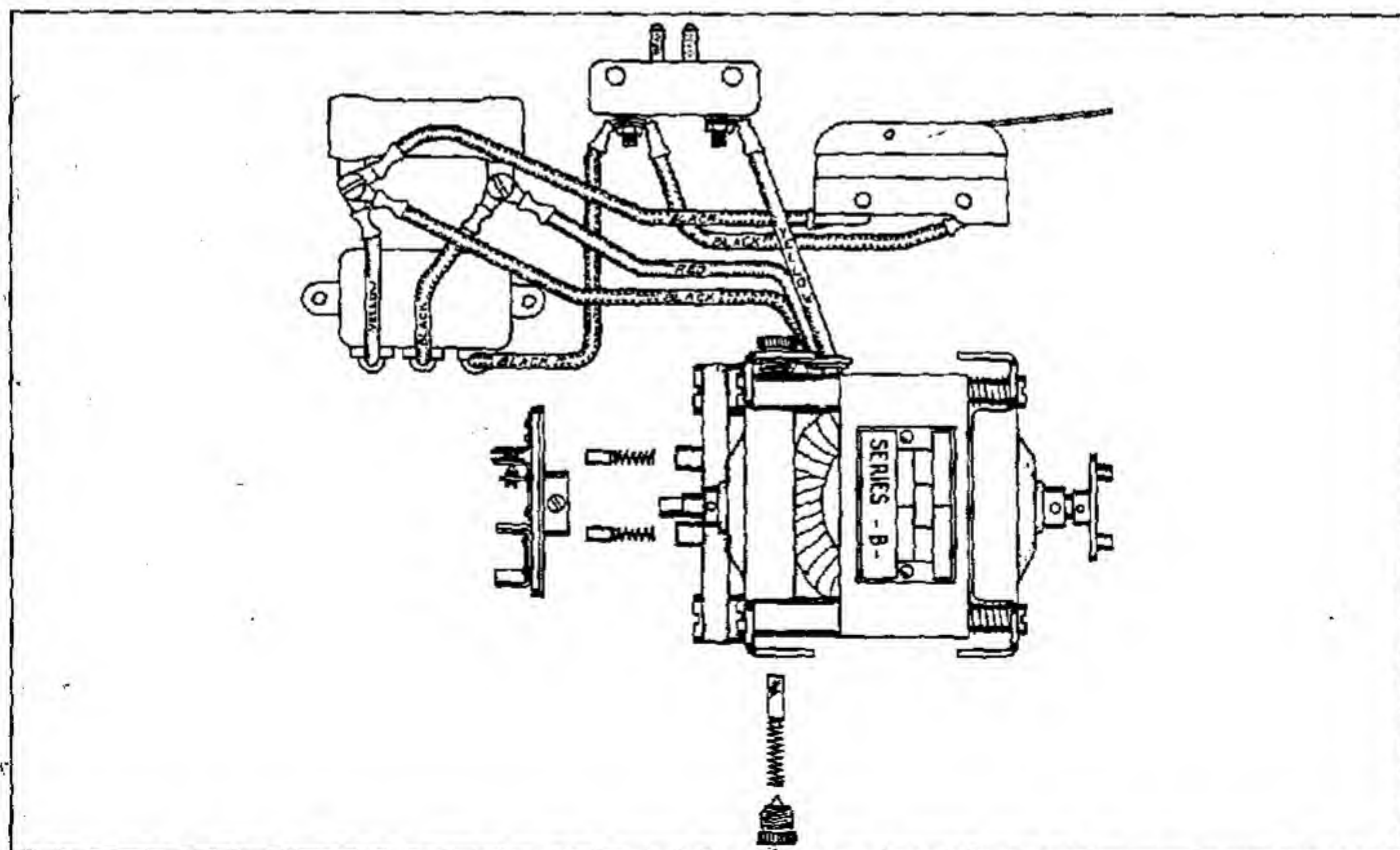
When making corrections in adjustments, and in particular in the case of Sequence Adjustments, be SURE to follow the line of adjustments all the way through to determine where adjustment or correction is needed. Many times machine troubles are multiplied when the mechanic starts making adjustments without first determining WHERE correction is needed. Make sure of your diagnosis before doing anything to a machine; your corrections will be far easier, more efficient and quicker.

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CHAPTER 1. WIRING AND TIMING
a. WIRING DIAGRAMS

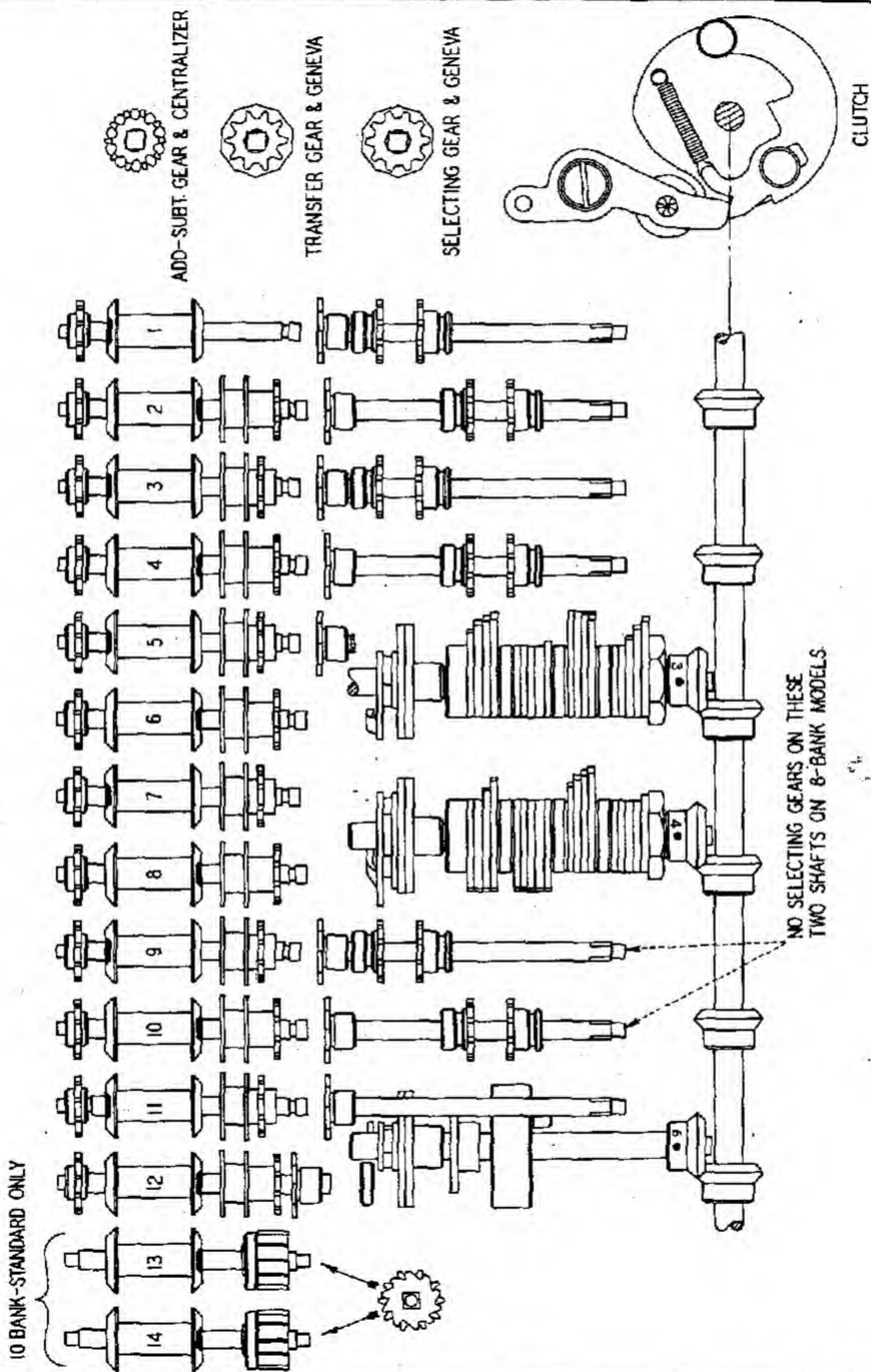


1. Wiring Diagram for Series "C" Motor. Note Motor has five lead wires.



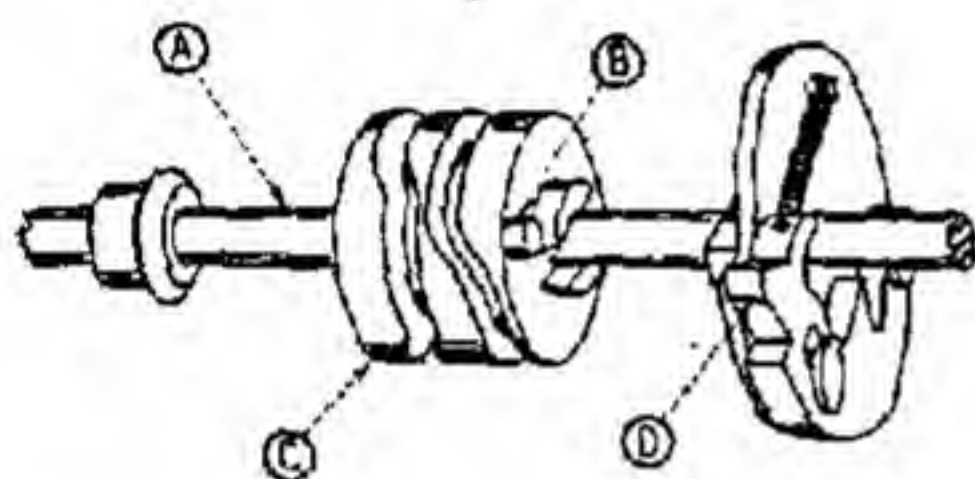
2. Wiring Diagram for Series "B" Motor. Note Motor has three lead wires.

b. TIMING

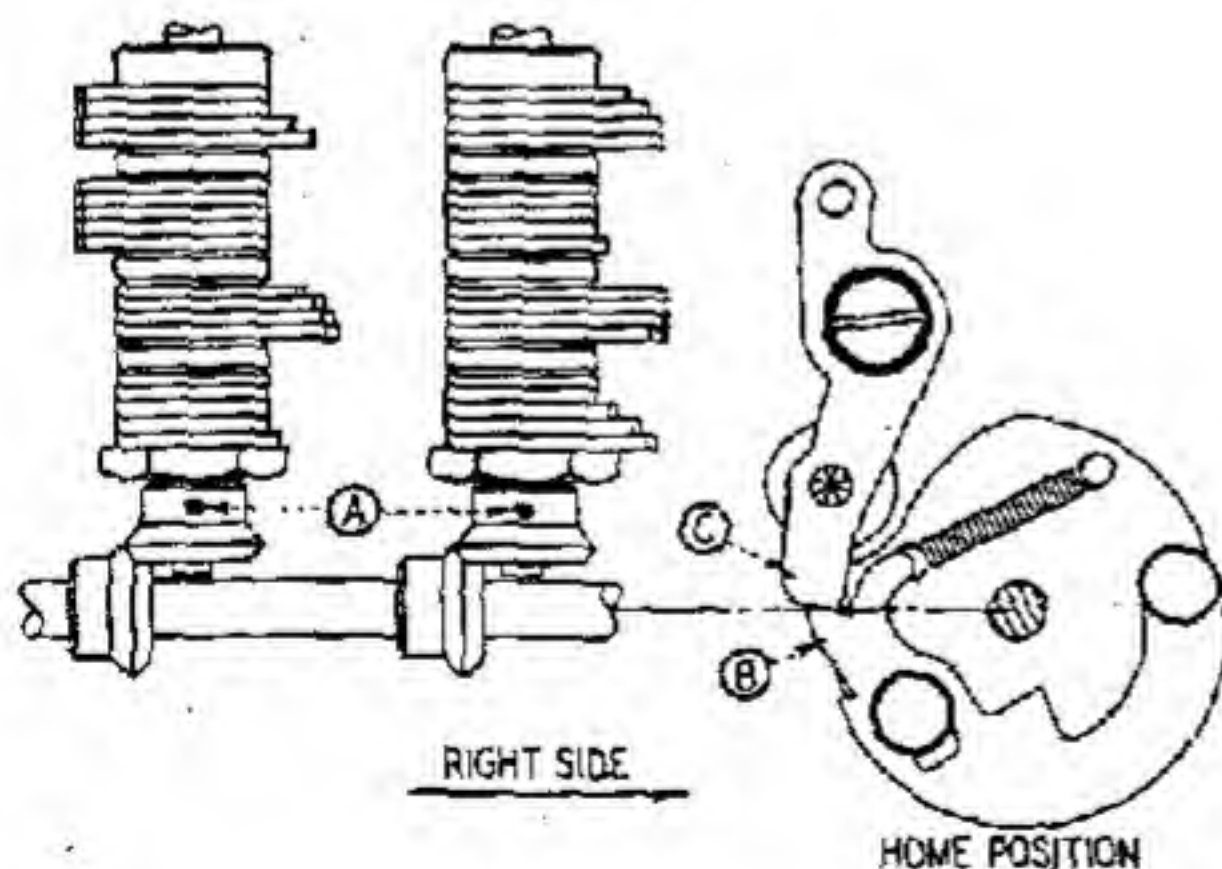


3. **TIMING CHART:** The preceding full-page drawing shows the timing and installation of the various sections of the Actuator and Selecting Units for both 8 and 10 Bank machines. You will note the 10 Bank #6 Actuator is used for both 8 and 10 Bank machines to standardize manufacturing procedure and therefore, the timing and installation of Selecting Gear Shafts and Add-Subtract Gear Shafts is the same for both 8 and 10 Bank machines. This same Chart is also used for Complete Transfer machines. The addition of the two Extra Transfer Shafts completes the Unit for 10 Bank standard machines.

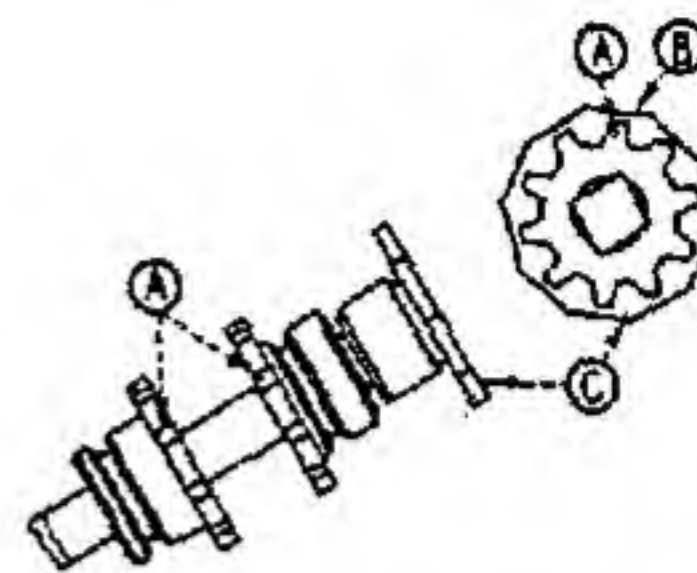
The following drawings explain in more detail the individual timing units.



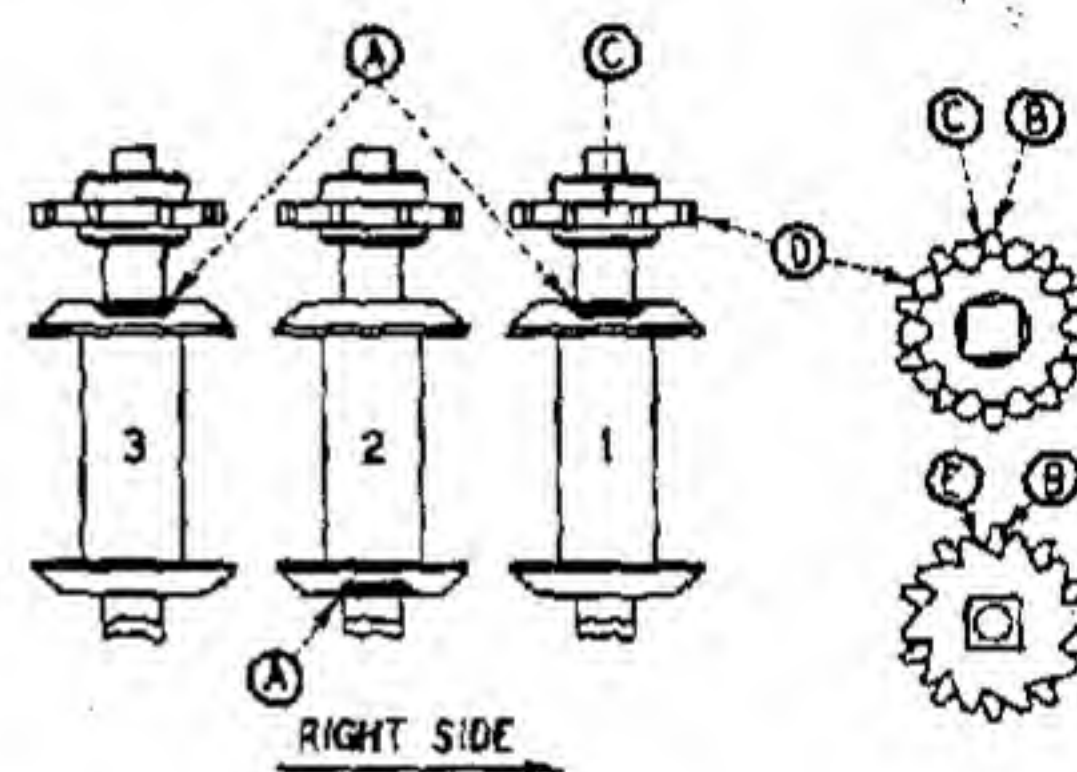
4. **DRIVE SHAFT AND CLUTCH ASSEMBLY:** Before installing the Clutch, position the Drive Shaft A so Key Board Clear Stud B on the Counter Oscillator Cam C will be up and toward the front of machine. Install Clutch with Lip of Clutch Dog D toward front of machine. Now, turn drive shaft until Clutch Dog is tight against Clutch Release Dog.



5. **ACTUATORS:** With Clutch Dog B tight against Clutch Release Dog C and Drive Shaft in Home Position, install Actuators with Punch Mark A on Gear Hub straight up. Begin with #1 Actuator on right side of machine. Any time the Drive Shaft is in Home Position, Punch Marks on Actuator Gears should be up.



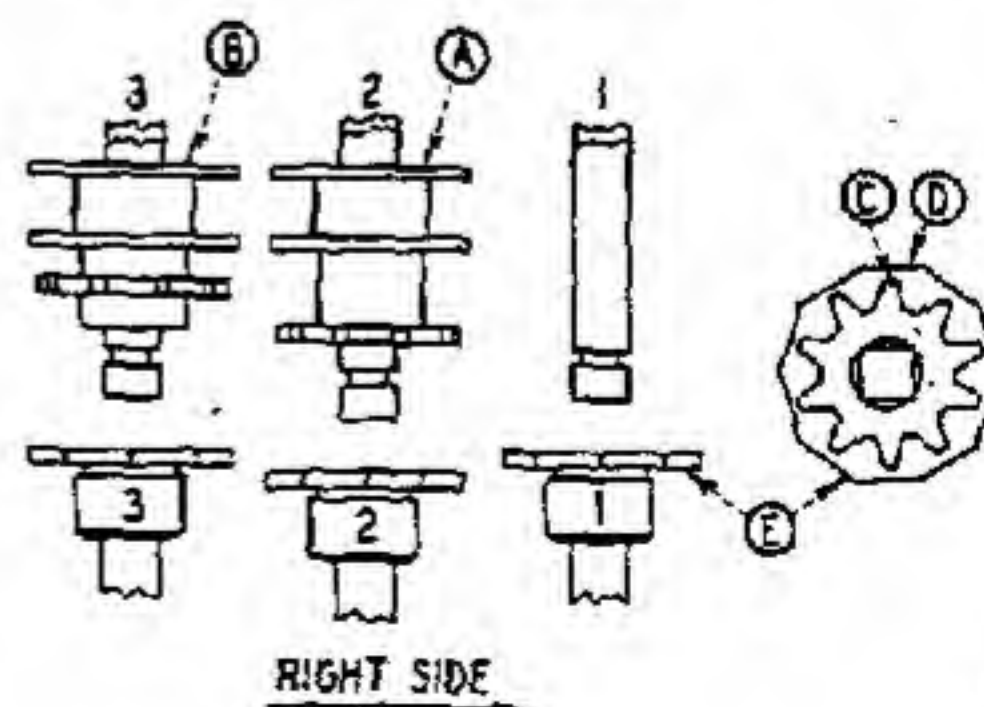
6. **SELECTING GEARS:** Selecting Gears are matched tooth A to Tooth A and installed on Selecting Gear Shafts Tooth A to Valley B of Geneva C, as shown.



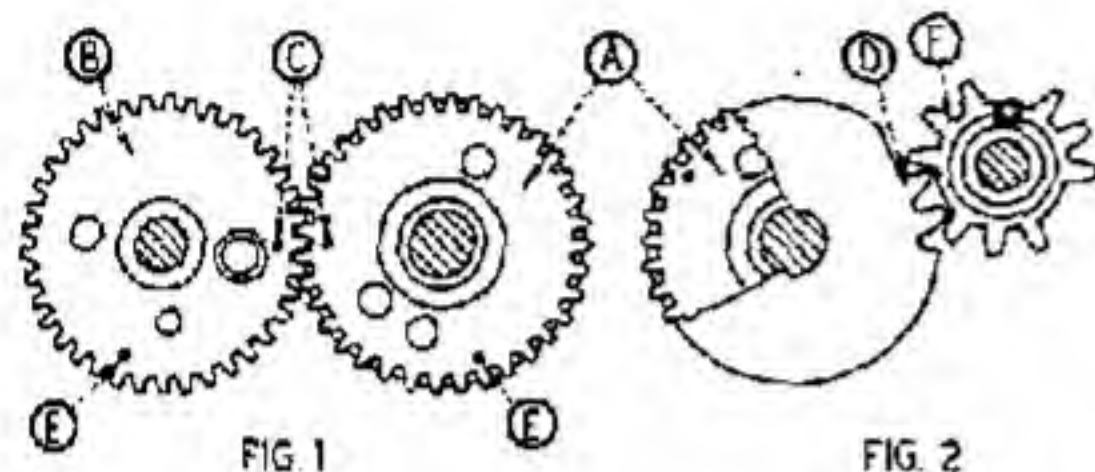
7. **ADD-SUBTRACT GEARS:** Note that one end of Add-Subtract Gear is COUNTERSUNK(A). This is a mark for identification. Install as shown, beginning on the right side of the machine. #1 Countersink A UP, #2 A DOWN, #3 A UP, alternating UP and DOWN to and including #11, which is UP. #12 is a Special Add-Subtract Gear - Geneva Unit. On Extra Transfers #13 and #14, Countersink A is DOWN on both. Add-Subtract Gears are installed on Add-Subtract Gear Shafts with Tooth B to Valley C of Centralizer Detent D. Extra Transfer Gears Tooth to Valley of Ratchet Gear E.

NOTE: #11 Add-Subtract Gear Shaft is Special and has a groove near Detent for identification.

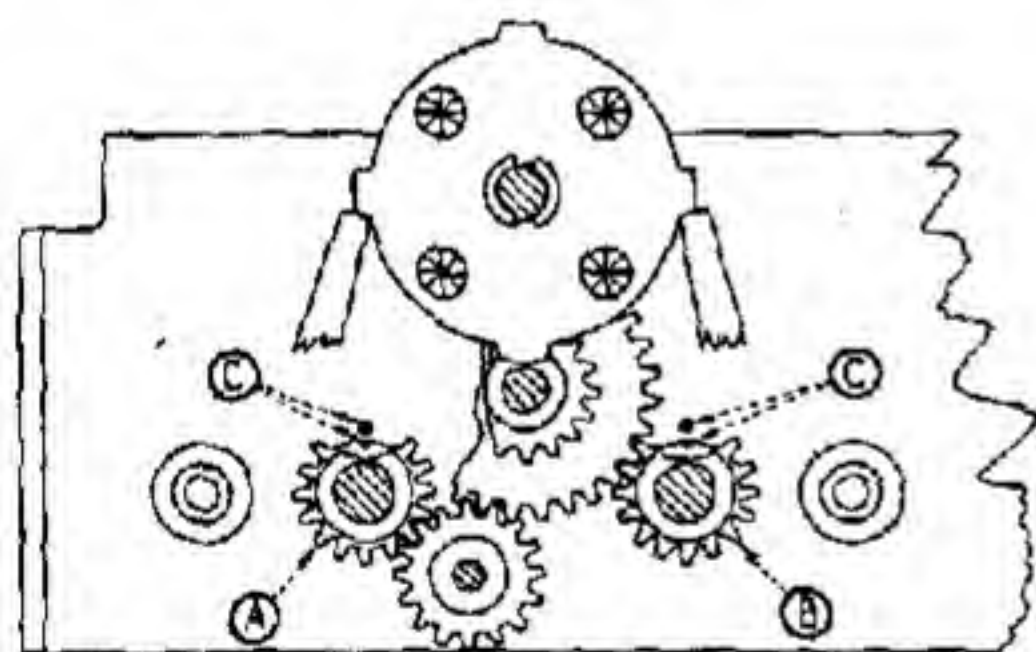
When properly installed, all Add-Subtract Gear will have one tooth straight UP.



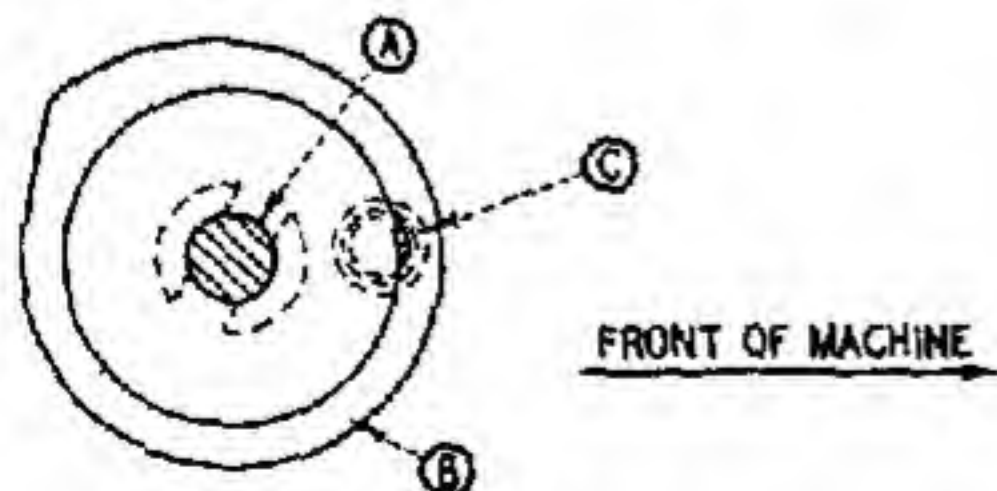
TRANSFER GEARS: No Transfer Gear on #1 Add-Subtract Gear Shaft. Begin with a LONG Transfer Gear A on #2 Add-Subtract Gear Shaft. SHORT Transfer Gear B on #3 Add-Subtract Gear Shaft, alternating LONG and SHORT to and including #11 which is SHORT. #12 is Special Assembly, which includes Shaft, Gears and Geneva complete. Time Transfer Gears Tooth C to Valley D of Geneva E.



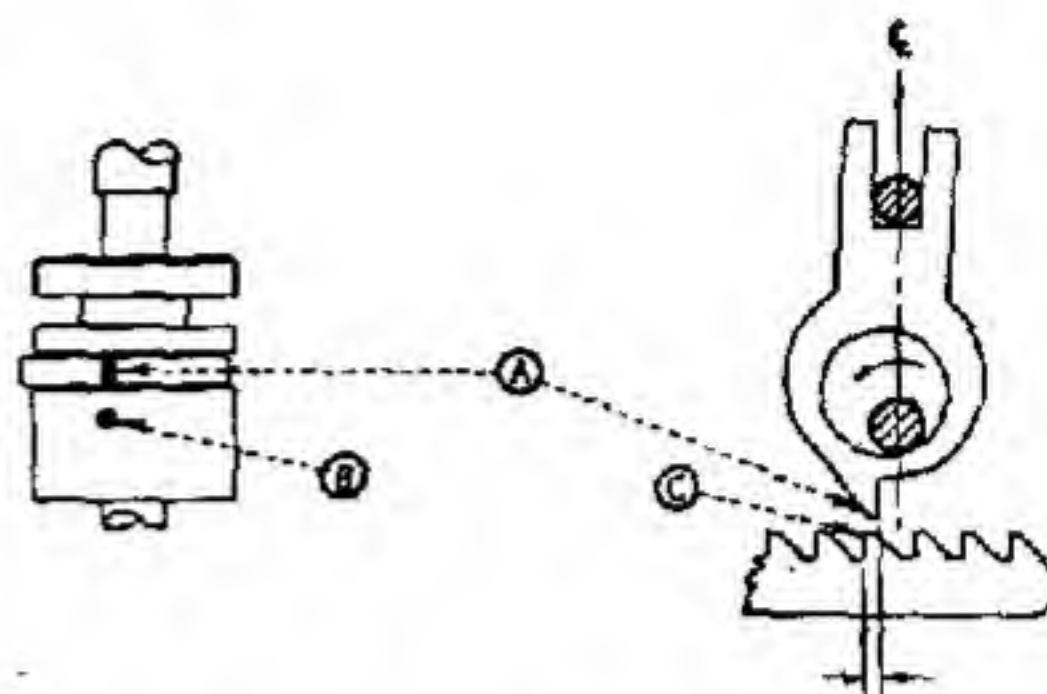
9. DIVISION IDLER GEAR: Fig. 1. Time Idler Gear A and Drive Gear B to Punch Marks C, as shown. Disregard Punch Marks E. Fig. 2. Idler Gear in Home Position; note position of the two teeth on Intermittent Gear D and Division Control Gear F. NOTE: When C Punch Marks are lined up on both Drive and Idler Gears as shown in Fig. 1, Idler Gear A may be removed without removing Division Drive Gear B.



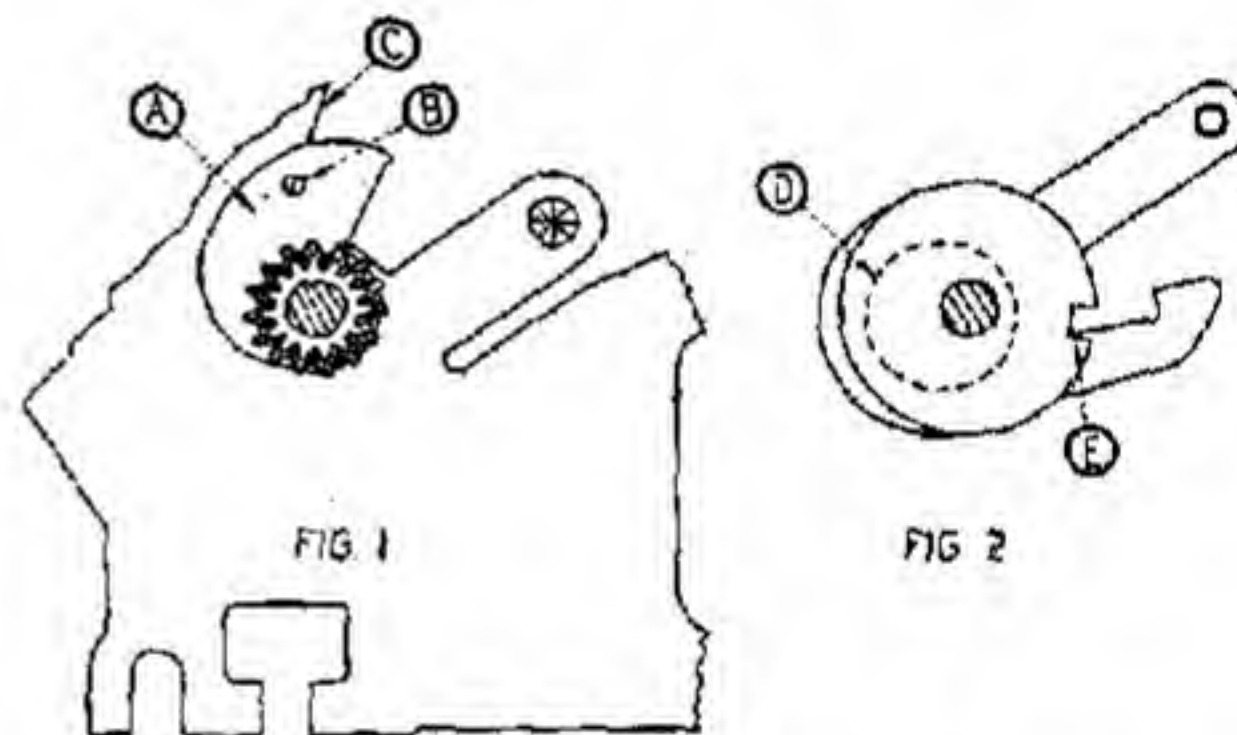
10. SHIFT DRIVE GEARS: Time Shift Drive Gears A and B to Punch C, as shown. Smooth Shift is shown, but the same timing is to be used for Two and Four Point Shift on all "W" Line machines.



11. POWER SET CAM: With Main Drive Shaft A in Home Position, time Power Set Cam B with Stud and Roller C toward front of machine.

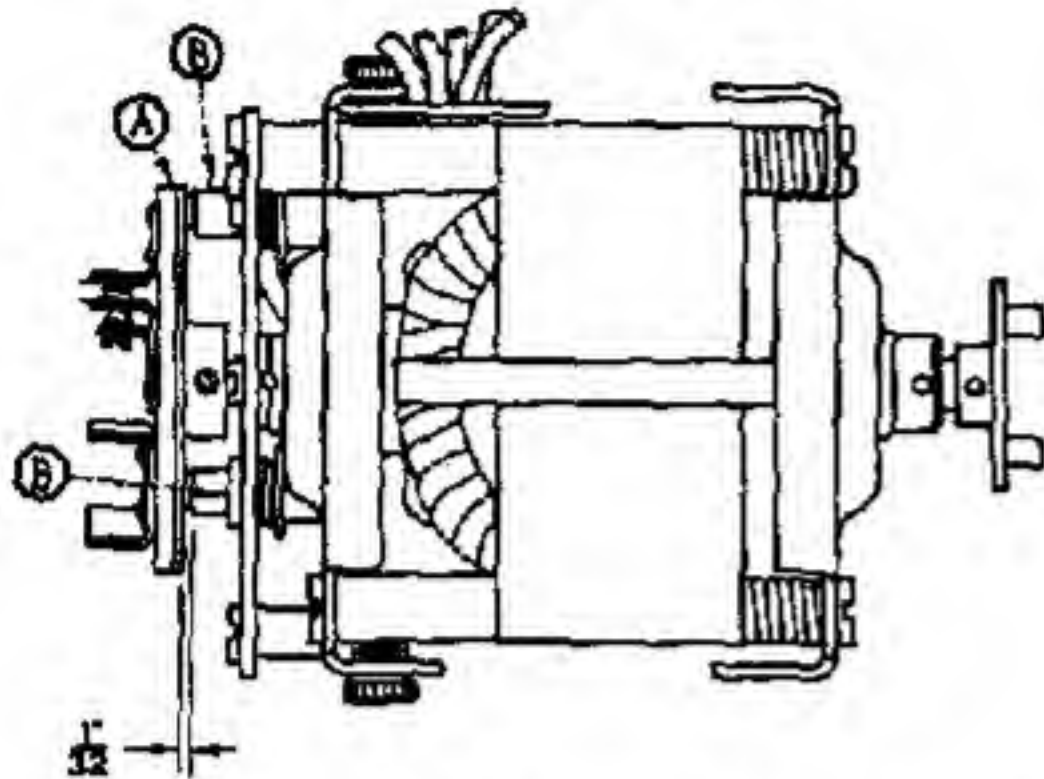


12. MULTIPLIER UNIT SHIFT SHAFT ASSEMBLY: With Drive Shaft in Home Position, point of Shift Pawl A should be in line with Punch Mark B on Drum below Shift Pawl. If in doubt, space Multiplier Unit several places to the left (Cord detached), depress Multiplier Clear Key and note that point of Shift Pawl A will be positioned slightly to the right of a tooth on Shift Rack C.

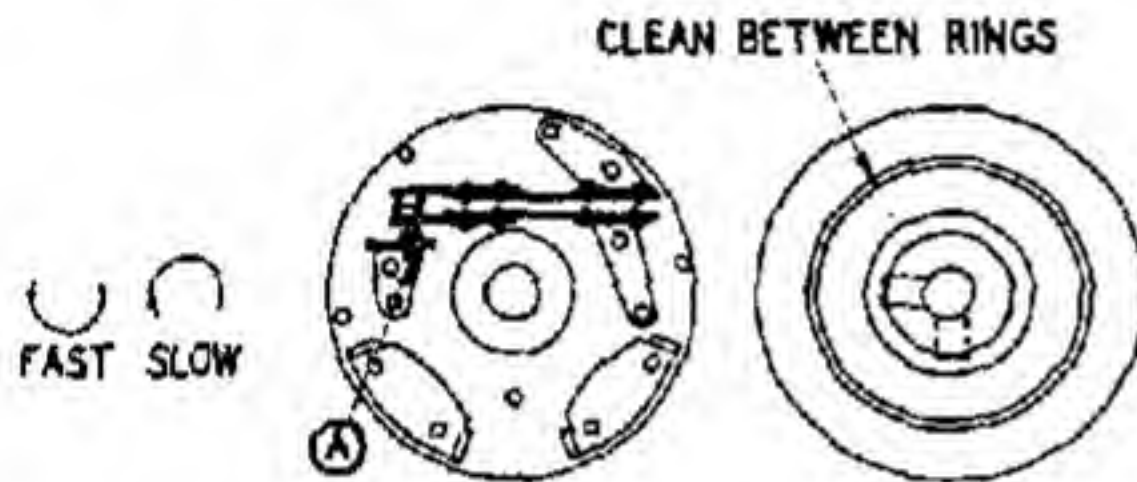


13. SHIFT SETTING AND DIAL RESET SHAFT ASSEMBLY: Fig. 1. With Drive Shaft in Home Position and Multiplier Unit Shift Shaft in proper time, Dial Reset Cam A at left end of Shaft will be UP and the Timing Hole B will be in line with edge of Frame C. Fig. 2. Cam D on right end of Shaft will be rearward and slightly down. Note position of Notch in Disc E.

a. MOTOR



14. GOVERNOR - ALL FRIDEN MOTORS: Set Governor A on Motor Shaft with approximately $1/32''$ clearance between Governor Rings and Governor Brush Holders B, as shown.



15. GOVERNOR ADJUSTMENT AND MACHINE SPEED: Machine Speed, all "W" Models, is 495 not to exceed 500 revolutions per minute. To increase machine speed, turn Adjusting Screw A IN. To decrease machine speed, turn Screw A OUT.

MOTOR TROUBLES: Motor failure: Motor fails to run at all: first, check Cord and Plugs to electric outlet; check Governor Brushes for sticking; Commutator Brushes; check Switch and Wiring.

Motor continues to run: check Switch, and if in good order and not sticking, then the chances are that the Capacitor is shorted and must be replaced.

Motor runs at excessive speed: Capacitor is shorted and must be replaced. Never allow machine to be run at this speed. When this condition is found in a machine, always check the Geneva's for burred points and for proper setting; the excessive speed may have damaged them.

Motor runs but is erratic in speed: check Governor Brushes for sticking; also check Commutator Brushes; check Governor Points.

Motor runs part of the time but has a "dead" spot where it will not start: check for sticking Brushes. If Brushes are in good order, chances are there is a dead coil, and it will be necessary to

replace the complete Motor.

MOTOR CARE: The Friden Motor requires little attention. Care should be exercised in lubricating and it is recommended that the Motor be lubricated only about once every six months or so, and then only one drop of light oil in each of the Shaft Bearings. Excess oil tends to foul the Commutator and Governor Brushes, causing excessive burning and arcing. This is also one of the causes of Brushes sticking and of Motor failure.

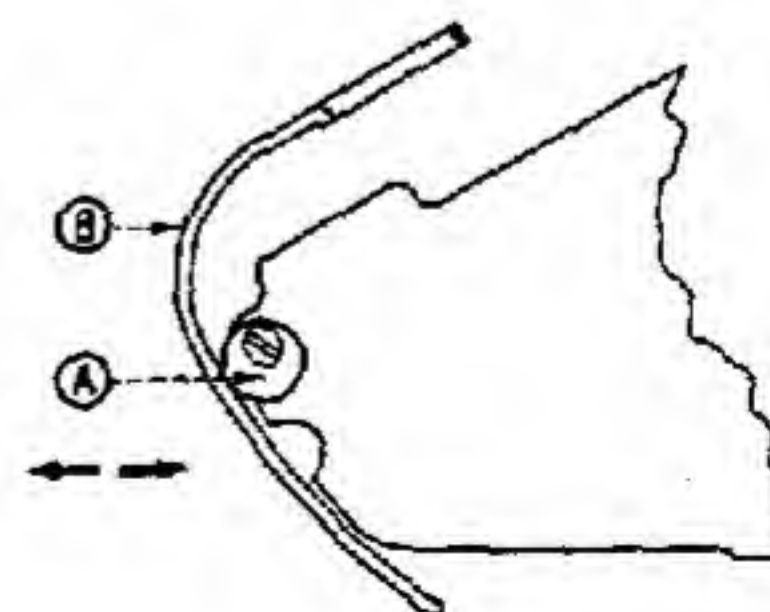
MOTOR ADJUSTMENT: When replacing a Motor, it is necessary to adjust or align the Motor with the Drive Pinion Shaft Coupling. A good method to obtain perfect alignment is to leave the Motor Screws loose enough so the Motor may be shifted slightly by hand; then with Motor running, move Motor by hand until the point of least vibration is reached; then tighten the Screws firmly. After Screws are tightened, power off, try turning Motor by hand; it should be perfectly free.

GOVERNOR CARE: Governor Contact Rings should be kept polished and smooth. This may be done by using Crocus Cloth or very fine sandpaper. In cases where the Governor Rings are badly scored and pitted, it is advisable to replace them with new or re-built Governor. If oil and dirt appear on the Governor, it should be removed and thoroughly washed in cleaning fluid. After cleaning or polishing the Governor Contact Rings, use a stiff brush to clean between the Rings to remove any foreign matter that might cause arcing or burning between them.

Governor Contact Points may need some attention; and in cases where pitting is not very severe, they may be filed or stoned to a smooth surface. If Points are badly pitted, Governor should be replaced.

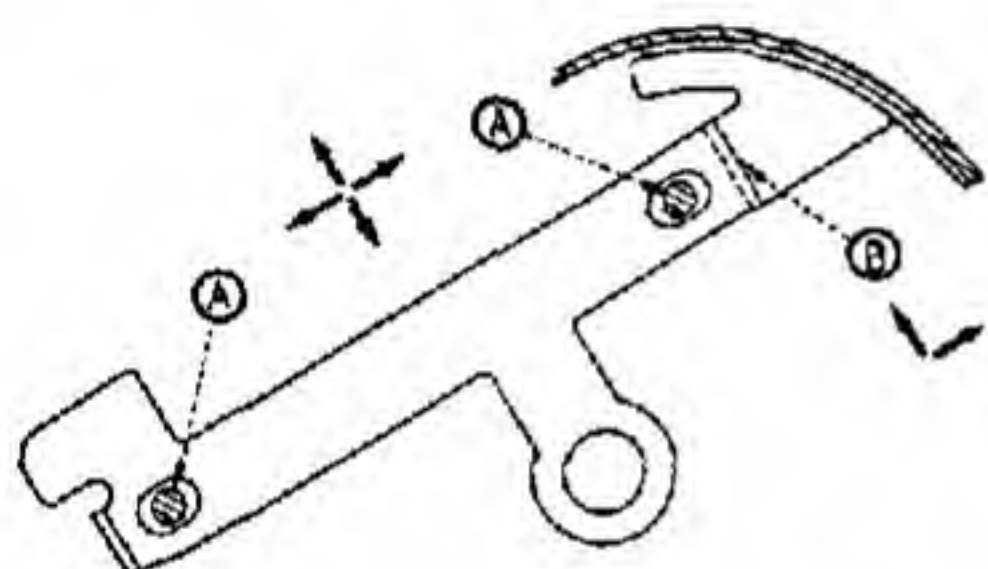
NOTE: Damaged Motors and Governors may be returned to the factory in San Leandro where they will be rebuilt at a nominal cost.

b. COVERS



16. FRONT TOP COVER ASSEMBLY: Top Cover should be adjusted to clear all Key Tops. To adjust, set Front Braces A, located at the front ends of Right and Left Side Frames, against Top Cover B to hold alignment with Key Tops. Key Tops should be approximately centered in holes front to rear.

Clearance of Key Tops side to side is more or less fixed and seldom needs adjustment. If it becomes necessary to relieve side pressure on Key Tops, proceed as follows: determine which way Top Cover should go; then remove Side Cover on side to which Top Cover is to be moved. Remove Side Cover Mounting Stud; place one or two 4017 washers under Stud. It is quite possible the Side Cover is exerting pressure on the Top Cover to throw it out of line. If this does not give sufficient relief it will then be necessary to realign the Front and Rear Top Cover Mounting Brackets.



17. CARRIAGE COVER BRACKETS, RIGHT AND LEFT: Carriage Cover should line up with Dials and Dial Twirlers so there are no binds and so figures on Dials are plainly visible in the Dial Windows. To adjust, loosen nuts at A and shift Brackets to position desired. To tighten Carriage Cover, form Ears of Brackets upward and outward at B.

MACHINE COVERS, CARE AND CLEANING: Touch-up enamel may be had for repairing scratches; however, in cases of severe damage to the finish, it is better to replace damaged Covers.

Plastic Indicators, such as Decimal, Carriage Position, etc., may be replaced by using a warm iron to spread the plastic tenon.

For removing various stains and ordinary soil from Covers, the following methods and cleaning agents are recommended.

COVERS, CLEANING PROCEDURE: A complete kit of cleaning materials would include the following:

- Cheesecloth or other soft material
- Nailbrush or soft Toothbrush
- Shell Oil Co. "Lacquer Diluent"
- Sanfords' Ink Eradicator

- Ditto Hand Cream Soap
- Acetone
- Ammonia, household strength

The following methods make use of the materials listed. A list of stains and the method of removal will be found at the end of this list of methods.

1. Shell Oil Co. "Lacquer Diluent." Use cheesecloth and a generous amount of solvent. Rub very lightly and change cloth frequently. Some stains require the cover to be removed and use of finger nailbrush and solvent.
2. Water, with or without soap. Use with cheesecloth or nailbrush.
3. Stanfords' Ink Eradicator. Rinse off with water.
4. Ammonia. Scrub with brush, rinse with water.
5. Acetone. Apply sparingly with clean cheesecloth. Wipe immediately with dry cheesecloth. Acetone softens paint; so exercise caution. If slightly softened, paint will regain its hardness.
6. Ditto Cream Soap or other duplicating ink-removing soap preparation. Rub soap thoroughly into stain and wash off with water. Bad stains may require more than one application.

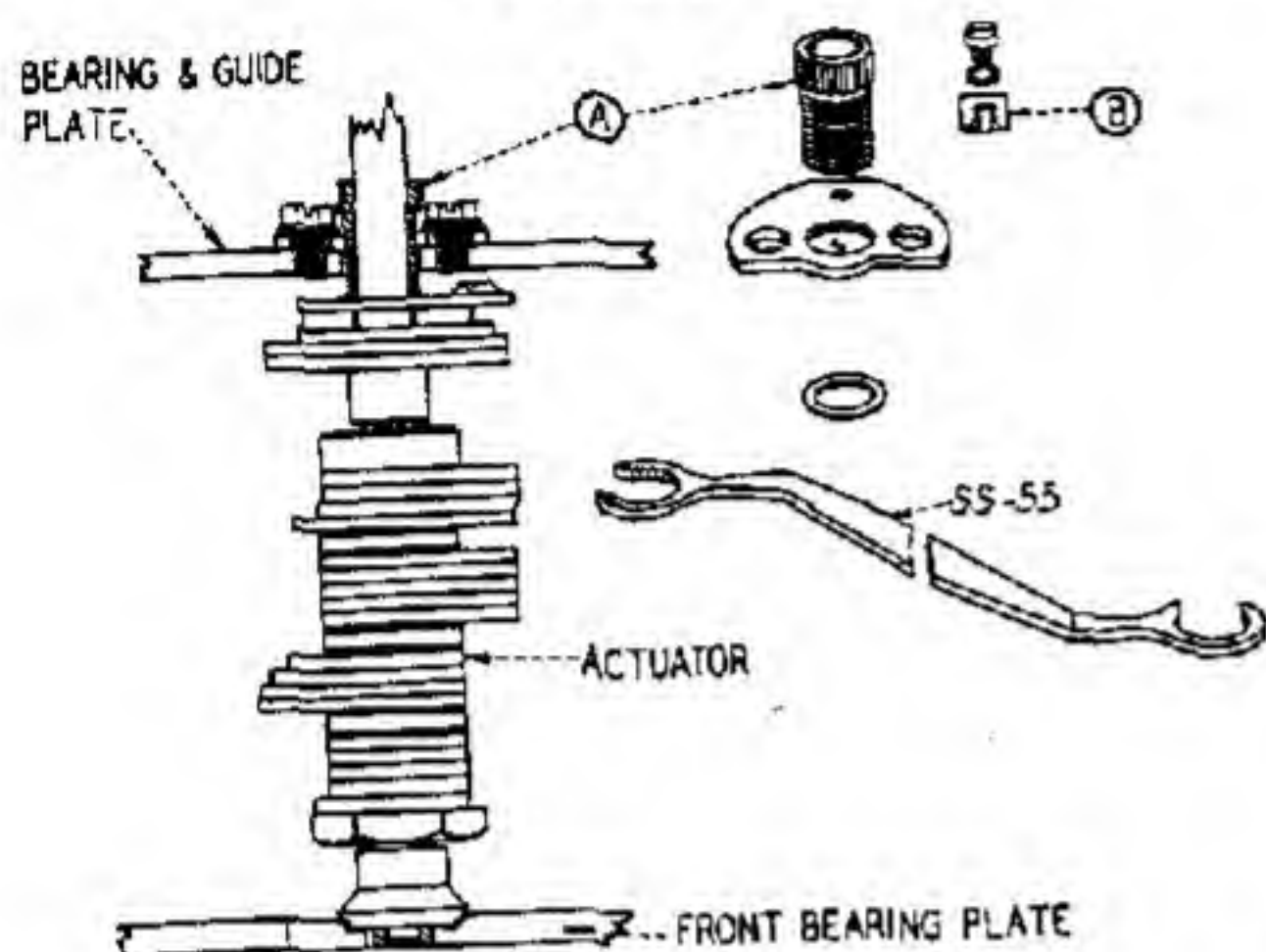
STAIN	METHOD
Candy	1
Carbon paper	1
General soil from hands, etc.	1
Grease	1
Ink, Ball Point	1
Ink, Stamp pad	1
Lipstick	1
Pencil, Colored	1
Pencil, Eyebrow	1
Pencil, Graphite	1
Pencil, Grease or china marking	1
Candy	2
Blood	2
Ink, Fountain pen	2
Ink, India	2
Ink, Washable	2
Ink, Fountain pen	3
Ink, India	4
Nail Polish	5
Ditto, Process Blue Pigment	6
Pencil, Indelible	6

FRIDEN CALCULATING MACHINE CO., INC.

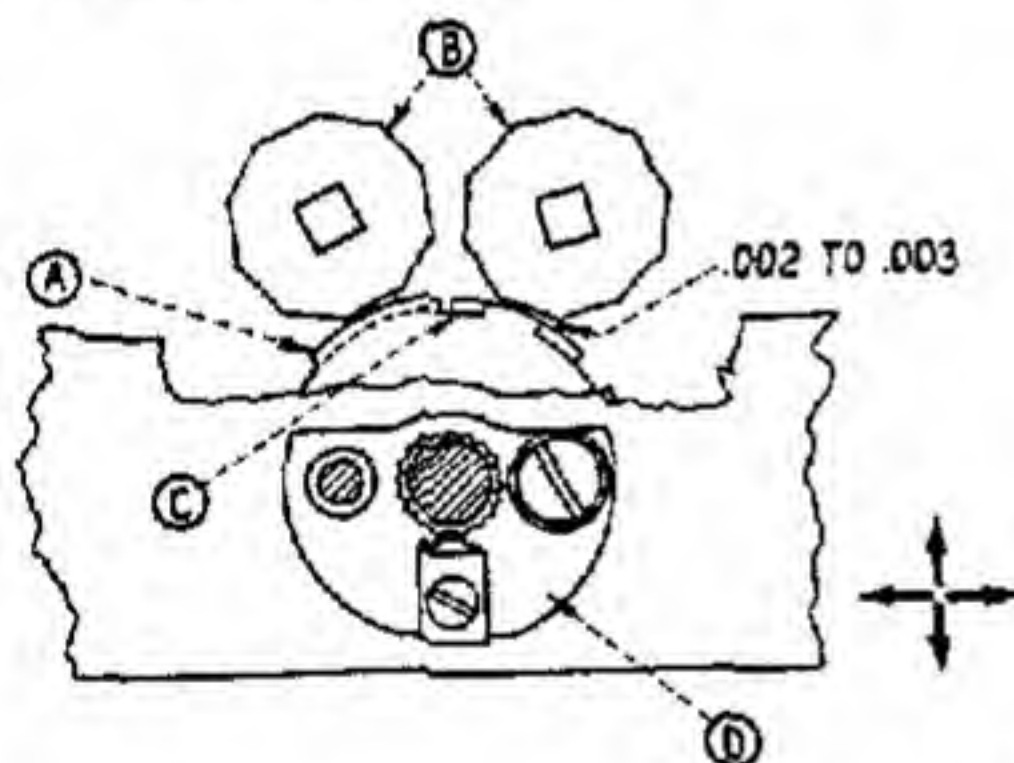
BASIC ADJUSTMENTS — NONSEQUENCE

It should be noted that water and Shell Oil Co. "Lacquer Diluent" will remove almost all ordinary stains. The Lacquer Diluent is to be particularly recommended for preliminary treatment and for the cleaning up of general soil.

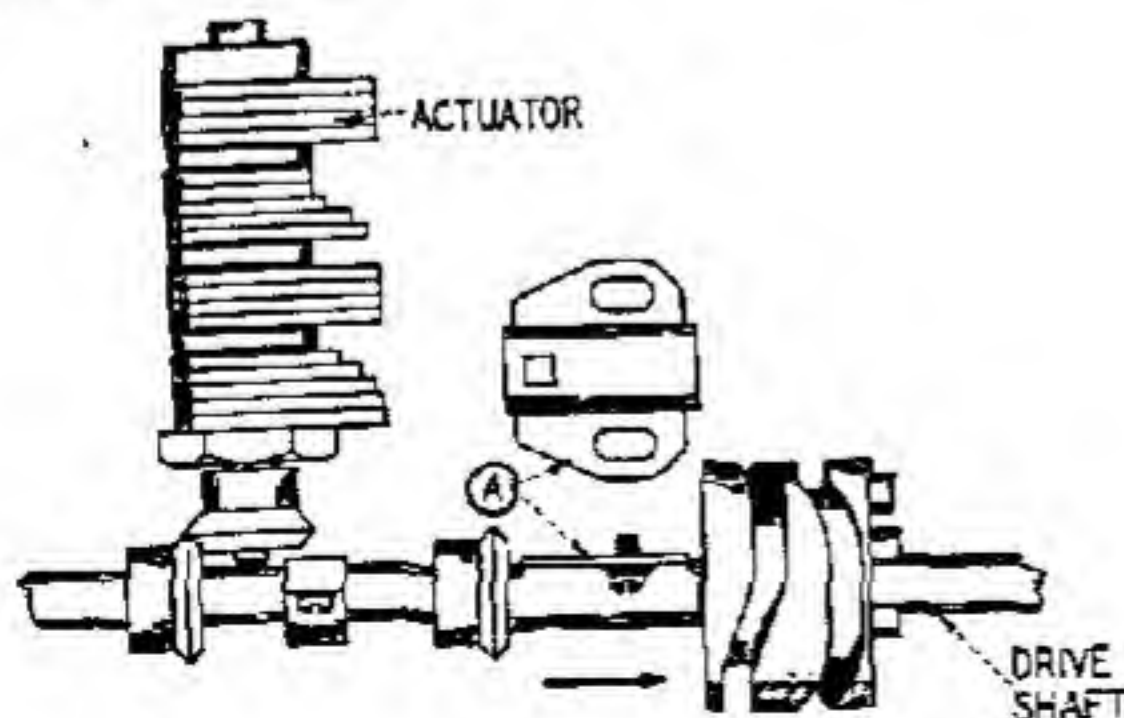
c. ACTUATORS



18. ACTUATORS: Should be perfectly free in action without end play. Adjust Bearing A with wrench #SS-55. Then tighten Detent B.

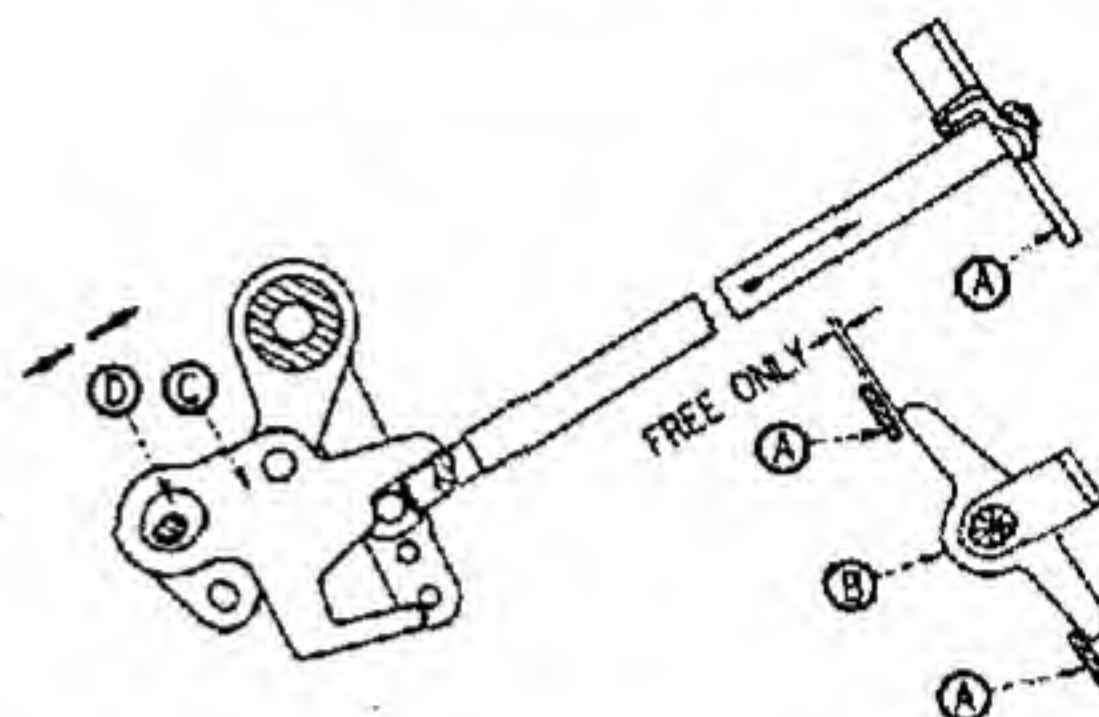


19. ACTUATORS, GENEVA DISC TO GENEVAS: There should be .002 to .003 clearance between raised Land on Geneva Disc A and Genevas B. Geneva should not spin in Transfer Dwell C. To adjust, rotate Actuator to position shown above and adjust Bearing D.

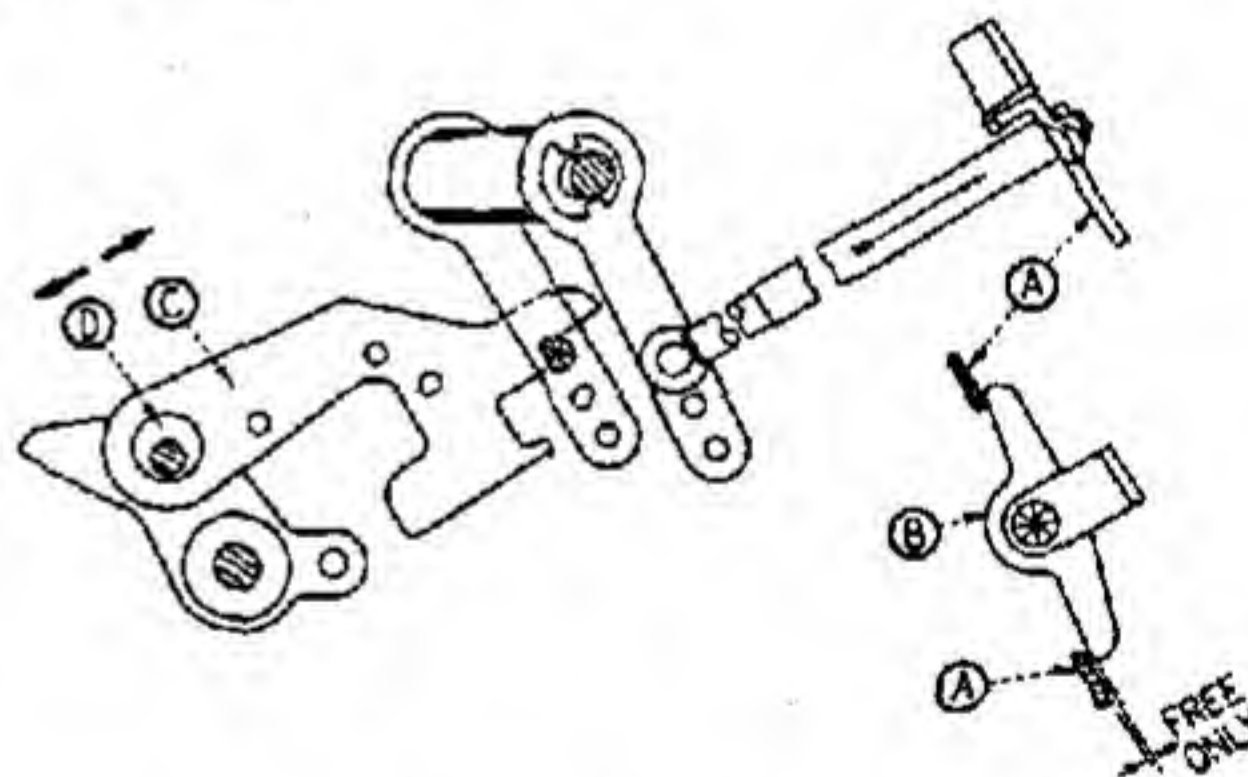


20. THRUST BRACKET FOR MAIN DRIVE SHAFT: There should be little or no backlash in the Actuators. The gears should be snug without noticeable drag. Adjust Bracket A to the right.

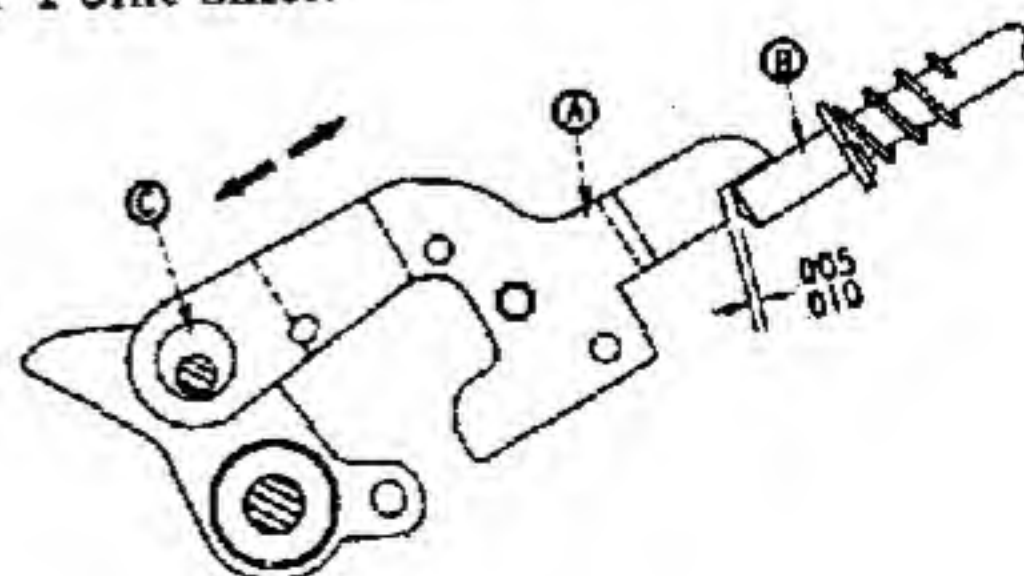
d. CARRIAGE SHIFT



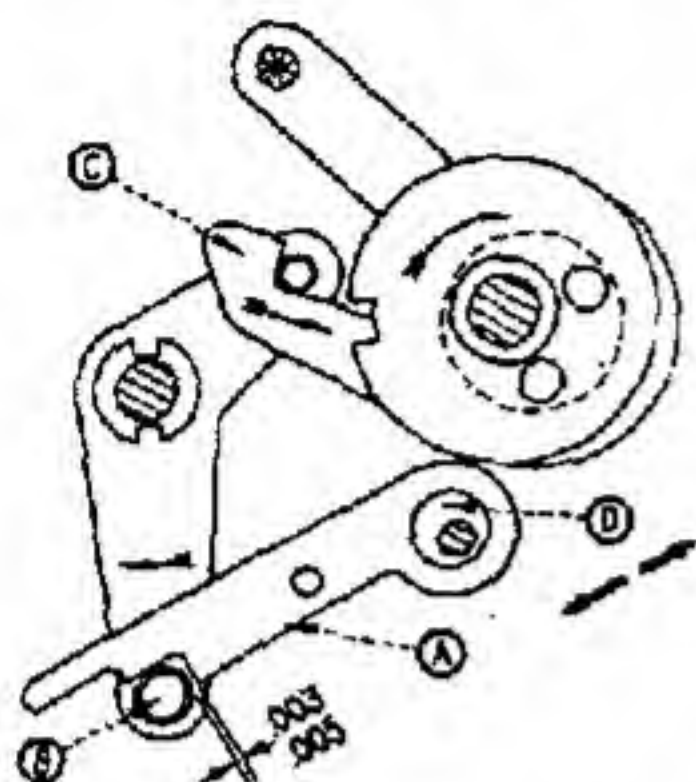
21. SHIFT ENGAGING LINK ASSEMBLY: In Shift Position, Shift Clutch Controller A should contact Shift Interlock B without pressure and without excess clearance. Adjust Engaging Link C by Eccentric D. Adjustment is for both Right and Left Shift. NOTE: Smooth Shift is shown, but same adjustment may be used for Two and Four Point Shift.



22. SHIFT ENGAGING LEVER-RETURN CLEAR: In Shift Position, Shift Clutch Controller A should contact Shift Interlock B without pressure and without excess clearance. Adjust Engaging Lever C by Eccentric D. NOTE: Smooth Shift is shown but same adjustment may be used for Two and Four Point Shift.

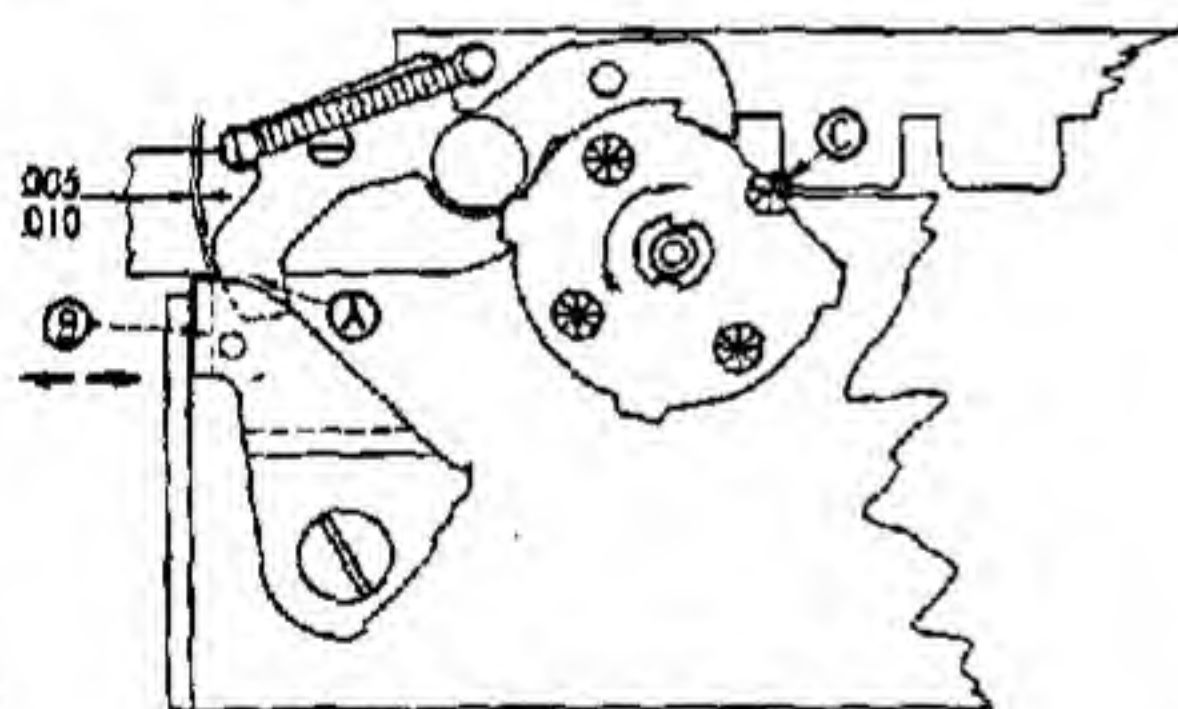


23. CARRIAGE CLEAR ENGAGING LEVER: In Home Position, Lever A should clear end of Push Rod B .005 to .010. Adjust by Eccentric C.



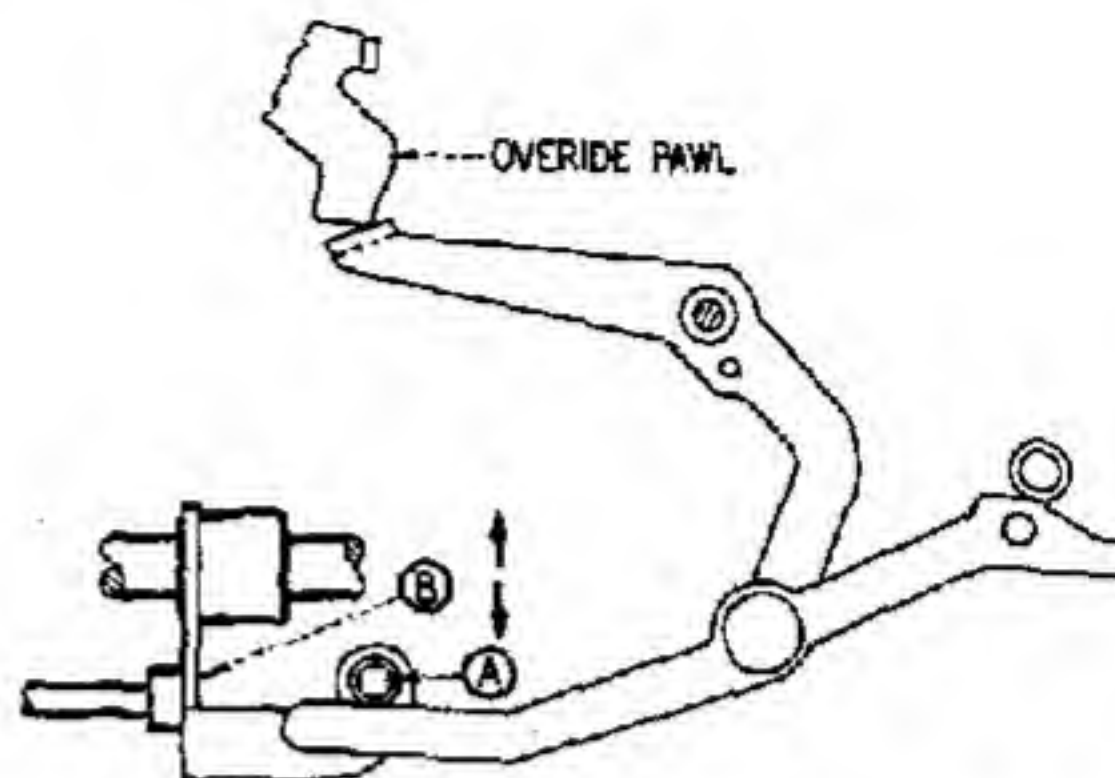
24. SHIFT SHAFT OSCILLATING LEVER LATCH: With Carriage Clear Key depressed, turn Drive Shaft slowly by handcrank. Latch A should have .003 to .005 overlatch on Roller B when Actuating Lever C is on high point of throw. Adjust by Eccentric D.

NOTE: The above amount of overlatch may vary with the Operating Key depressed; therefore, it is advisable to check this adjustment with other Keys operating through this mechanism, such as Dividend Tabulator and Multiplier Keys. Adjustment should be made to lightest Key.

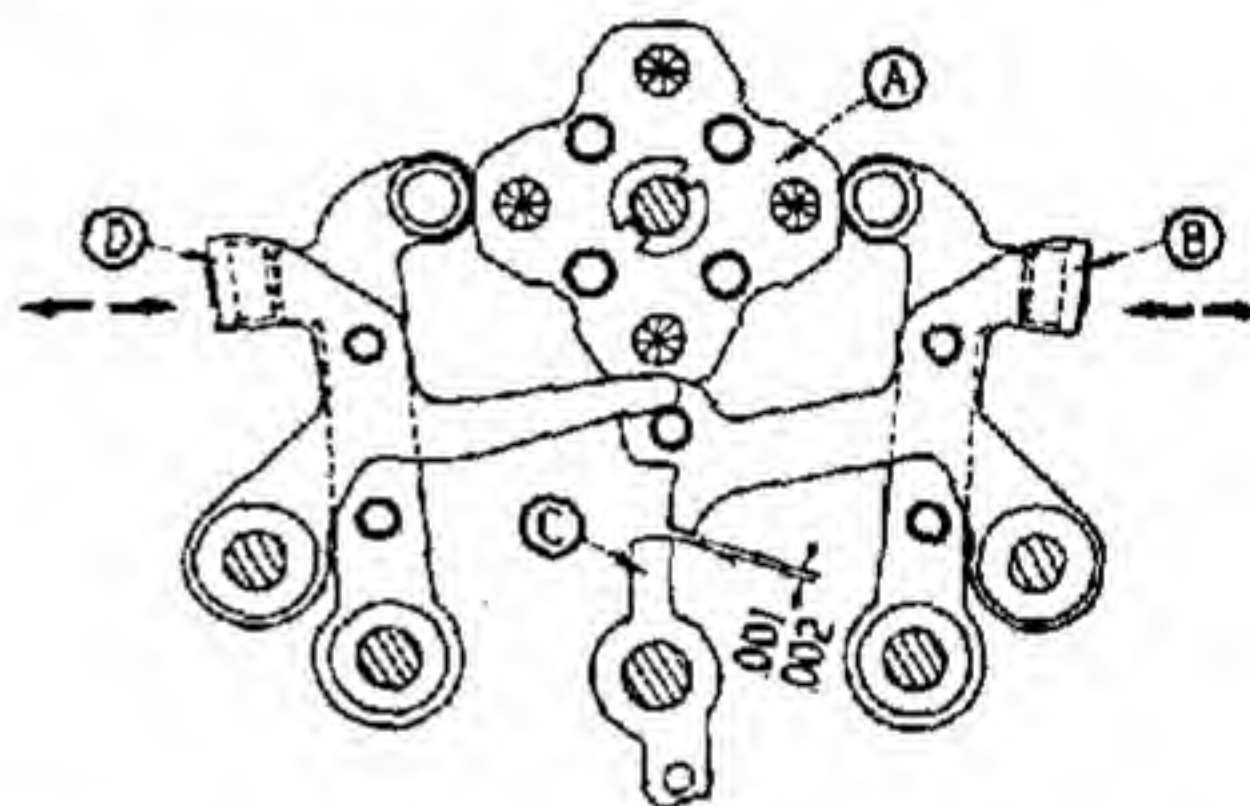


25. OVERRIDE PAWL STOP ON SHIFT BEARING PLATE (FOUR POINT AND SMOOTH SHIFT): End of Override Pawl A should clear Stop Lip B .005 to .010 when Carriage reaches point of greatest travel C to the left on Override Action. Adjust by forming Lip B.

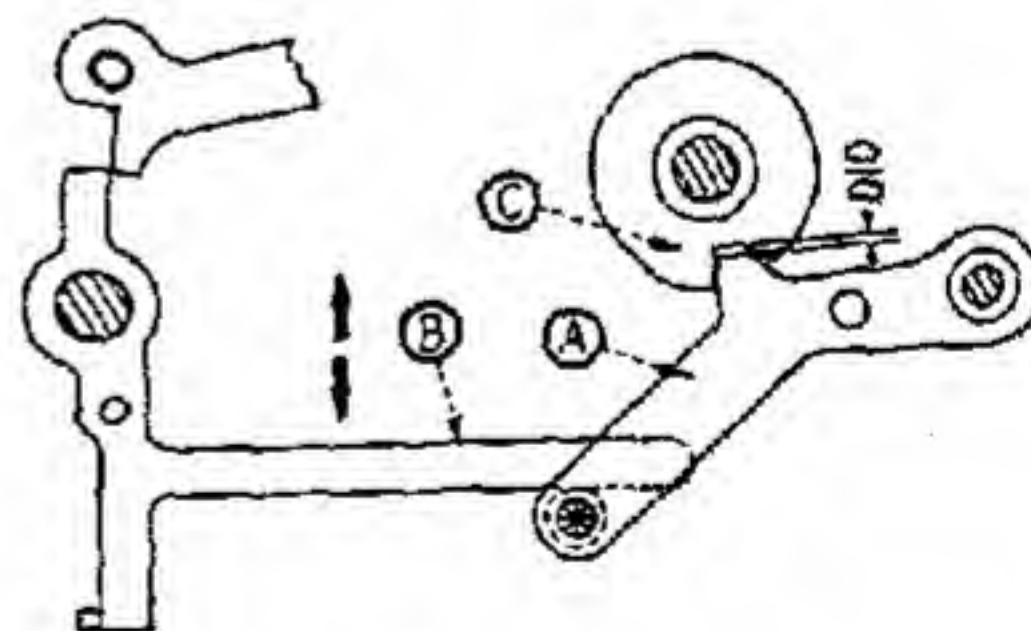
26. ACTUATING LEVER FOR RIGHT SHIFT DIS-ENGAGING LINK: With Right Shift Key held down; Shift Clutch should disengage when Shift Gear makes first Override Action. If Gear makes more than one Shift Action in this position, Roller A



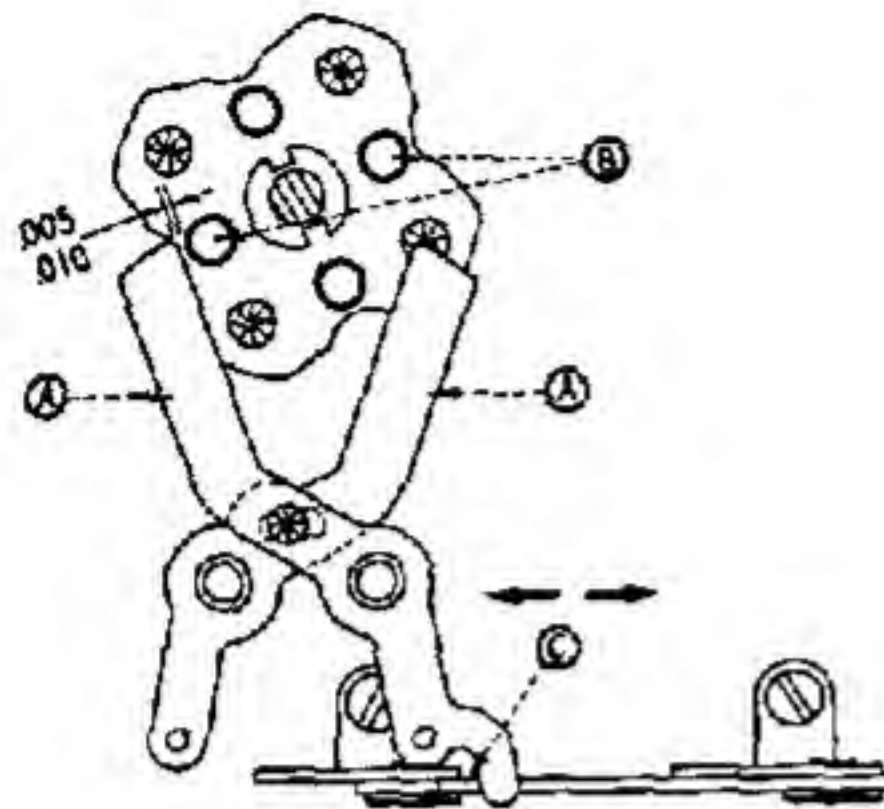
may be lowered by forming Lever at B. If Gear fails to complete Shift Action or tends to stick on high point, raise Roller A.



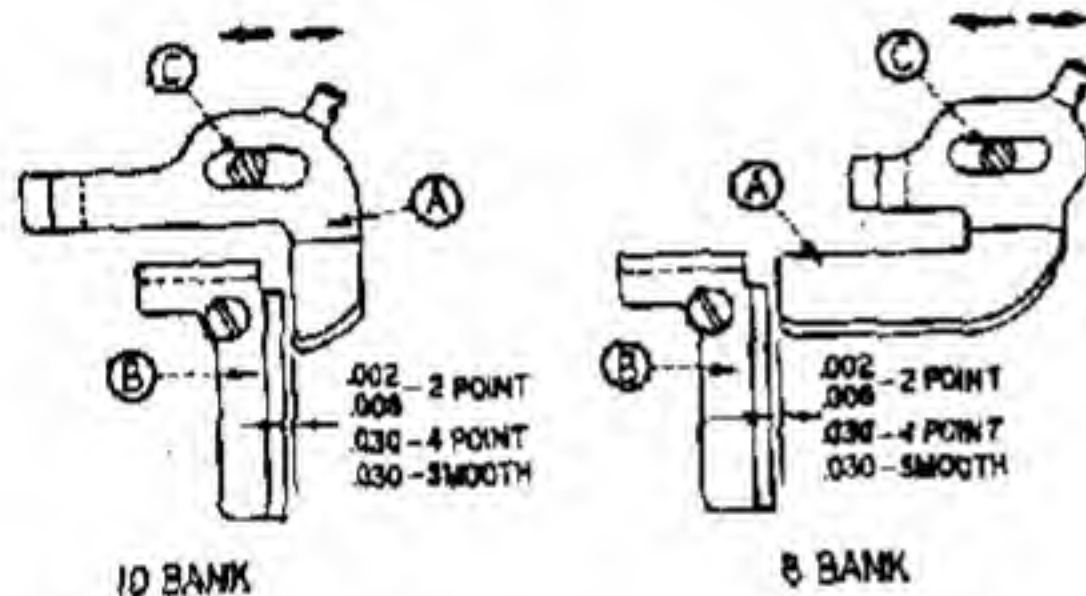
27. FOUR POINT SHIFT CENTRALIZER UNIT: When Shift Gear A is on high point as shown, Centralizer B should overlatch on Latch C .001 to .002. Adjust by forming ears on Centralizers at B and D, keeping adjustment even to prevent unnecessary bumping.



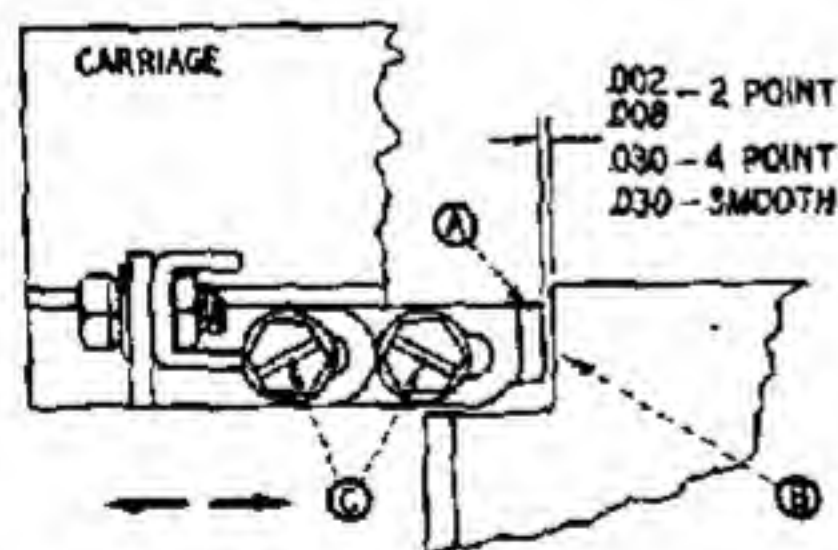
28. SHIFT CENTRALIZER CONTROL LEVER: On a slow release by hand, Lever A should release Latch B when Lever A is approximately .010 from bottom of Notch in Cam C. Adjust by forming lever of Latch at B.



29. SHIFT LOCKS: Upper ends of Shift Locks A should clear Studs B on Shift Gear .005 to .010 in both Right and Left Shift. Adjust by forming Lip C on Actuating Lever.

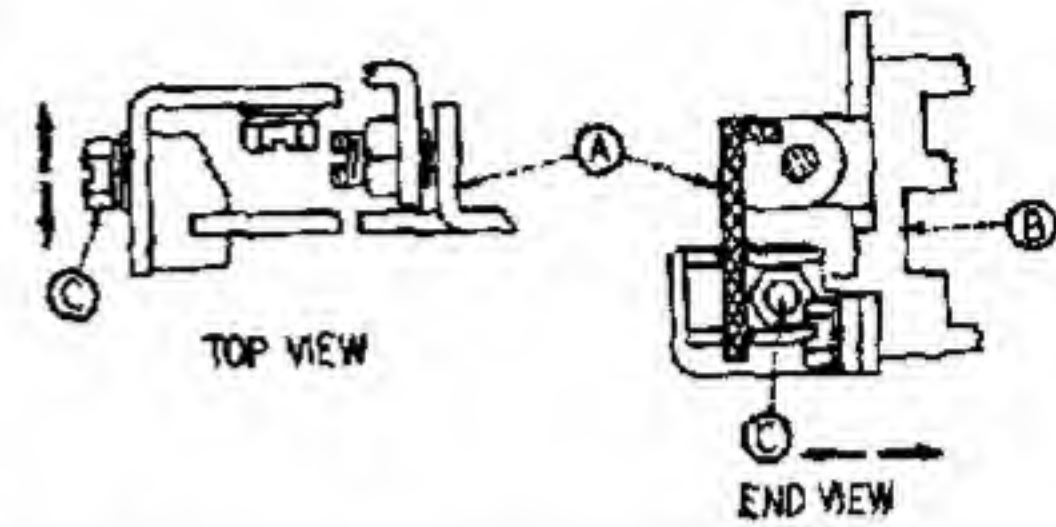


30. LEFT END CARRIAGE STOP, 8 AND 10 BANK: For Two Point Shift machines, Carriage in last position, Stop A should have .002 to .008 clearance to Left Carriage Clamp B. For Four Point and Smooth Shift machines, have approximately .030 clearance or set Stop A to touch B at point of Carriage motion with Shift Gear in Override Action. Adjust at C.



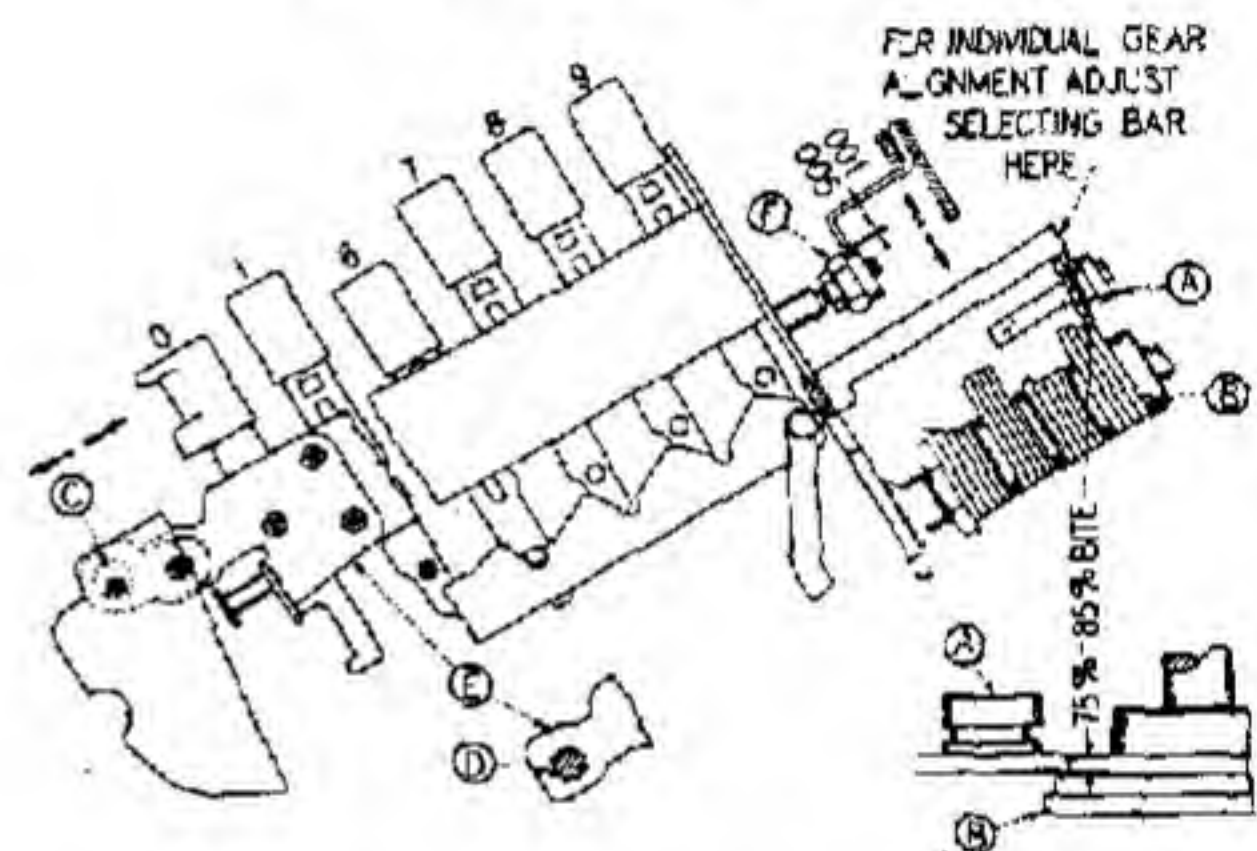
31. CARRIAGE STOP - RIGHT: For Two Point Shift machines, have .002 to .008 clearance between Stop A and Rear Bearing Plate B. For Four Point and Smooth Shift Machines, have approximately .030 clearance or set Stop A to touch B at point of Carriage motion with Shift Gear in Override Action. Adjust at C.

32. CARRIAGE SHIFT RACK CLAMP: Carriage Shift Rack A should be parallel to Carriage

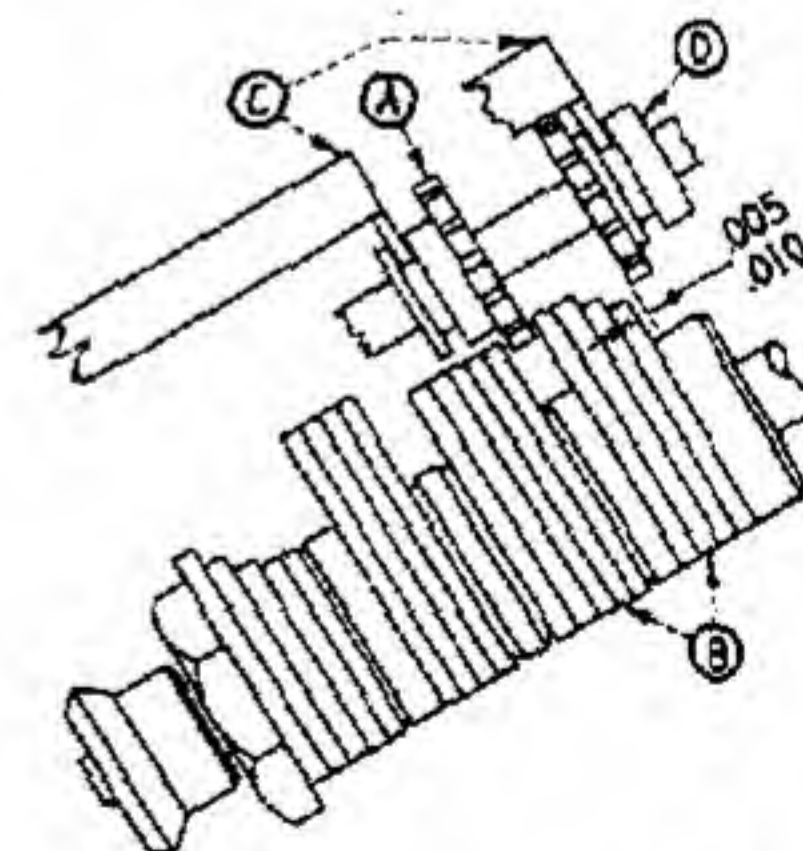


Frames B and should also clear the Shift Gear and Clear Slide. Adjust at C.

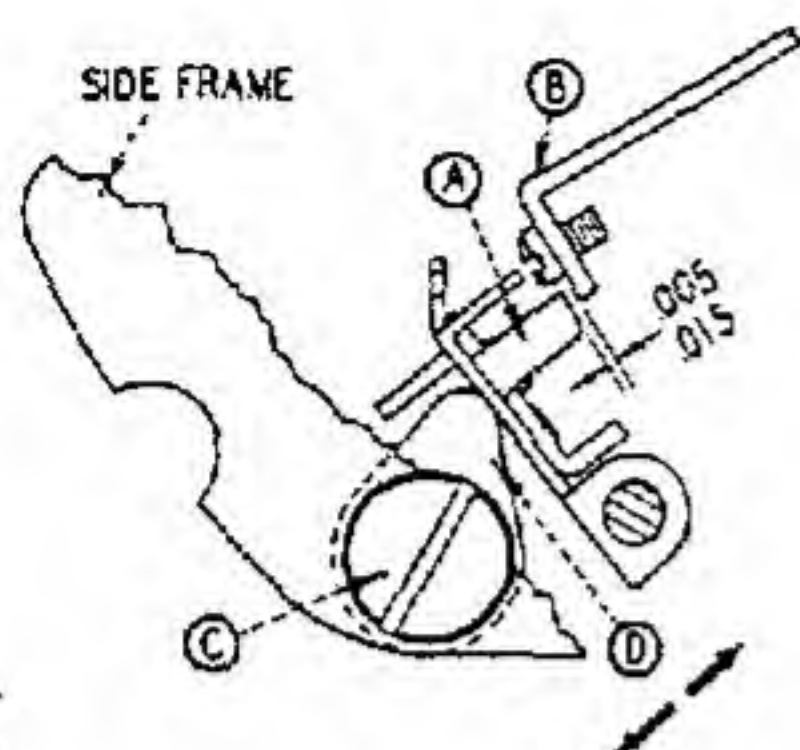
e. MAIN KEY SECTION



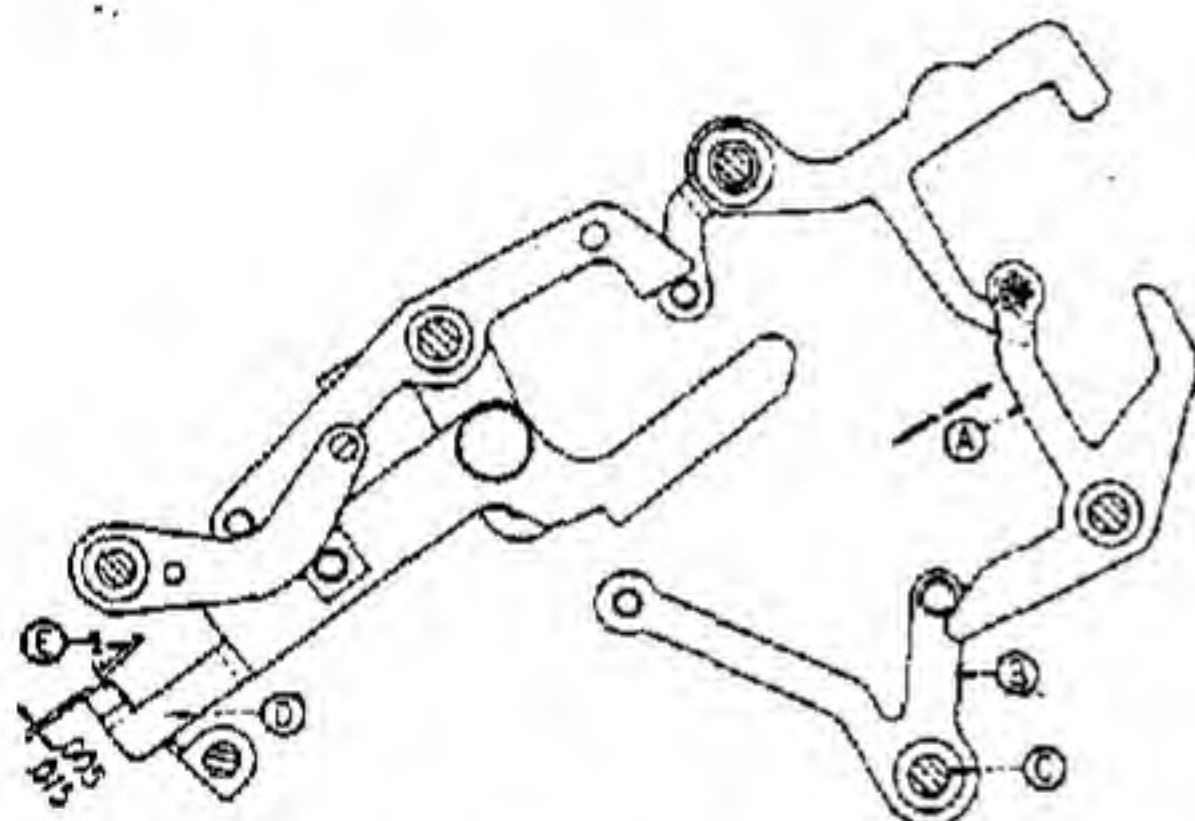
33. MAIN KEY BOARD SECTION: There should be approximately 75% to 85% bite of Selecting Gears A on Segments of Actuators B. Adjust by Eccentrics C located on both sides of Key Board. Square Brace Rod D should be kept at an angle to prevent slipping through square holes in Side Frame E. Note adjustment of Eccentric F for Upper Hold Down Bracket.



34. SELECTING BARS: In Home Position, Selecting Gear A should clear both Upper and Lower groups of Segments B on Actuators approximately equal. Gear D at upper end of Actuator should have .005 to .010 clearance to Segments. Adjust by forming Selecting Bar at C and be sure Selecting Bar is perfectly free after adjustment.

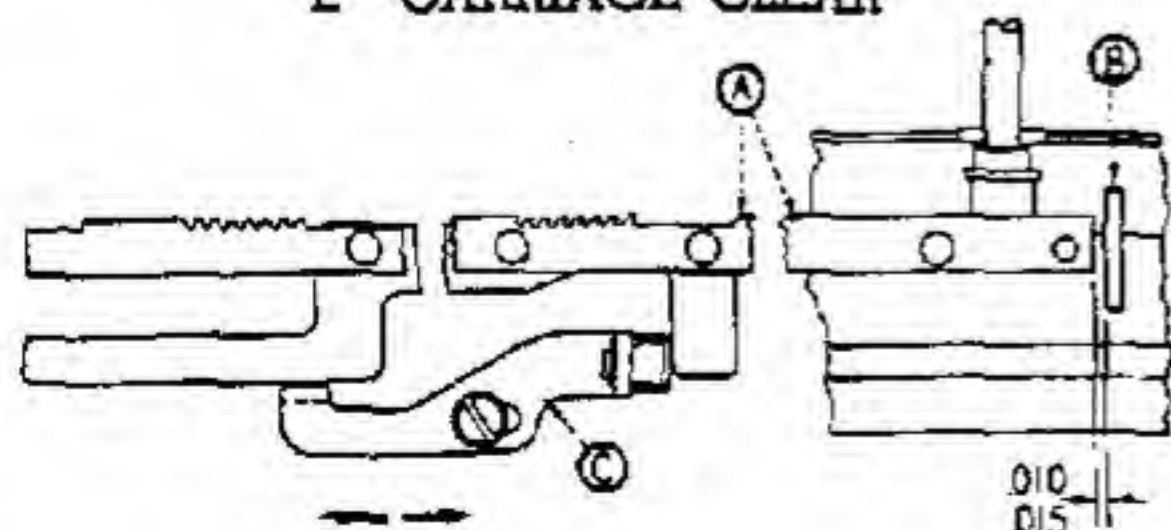


35. STOP FOR KEY BOARD CLEAR GATE: Stop should hold Clear Gate so there is .005 to .015 clearance between Slides A and Key Lock Bars B. To adjust, loosen large headed Screw C on right side of Right Side Frame and turn Stop D to desired position.

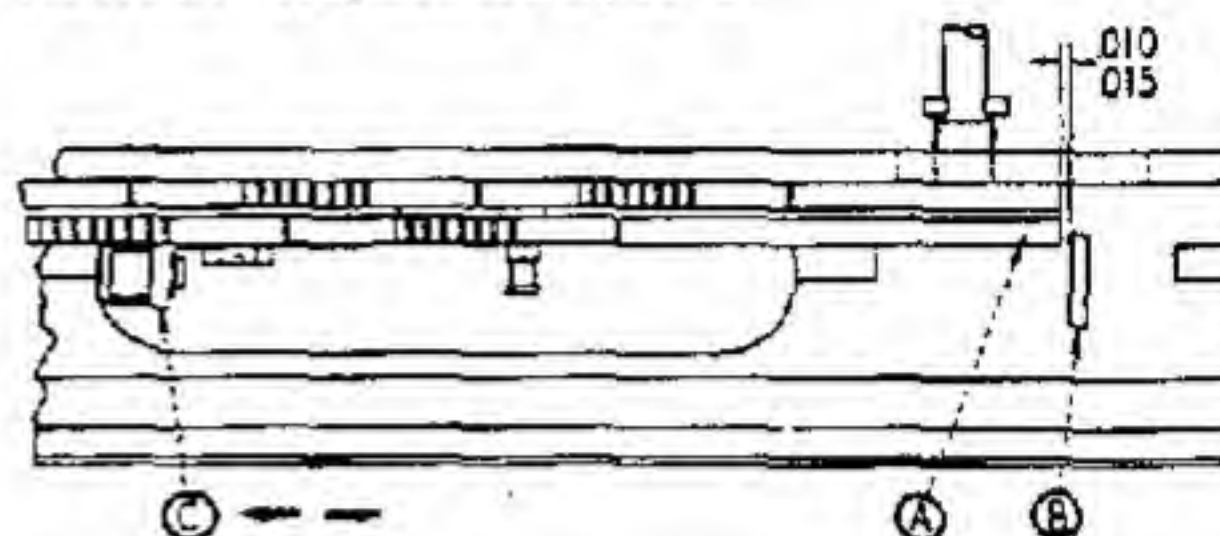


36. ADD PITMAN RELEASE ACTUATOR LEVER: When Dividend Tabulator Key or any of the Multiplier Keys is depressed, Lever A is actuated by part B on Clutch Release Shaft C. This action is transmitted to the Key Board Clear Link D through linkage, as shown, which lowers end of Clear Link below Clear Gate E to prevent clearing the Main Key Board until the end of operation. Since the amount of clearance between D and E varies with the Key depressed there should be .005 to .010 clearance between D and E on the lightest Key. Check this clearance on all the Keys mentioned above and also on Instant Carriage Return. Adjust by forming Actuator Lever at A.

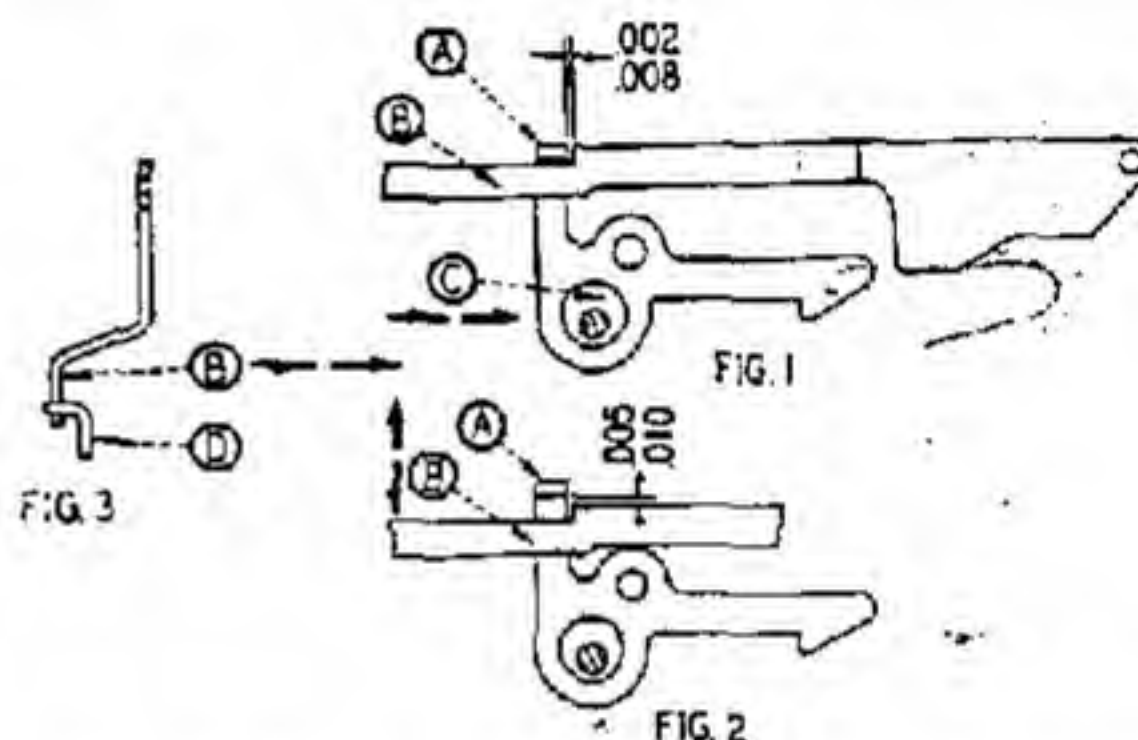
1. CARRIAGE CLEAR



37. COUNTER CLEAR RACK: In Home Position, there should be .010 to .015 clearance between right end of Clear Rack A and Slot B in Carriage Frames. Adjust Bumper C.



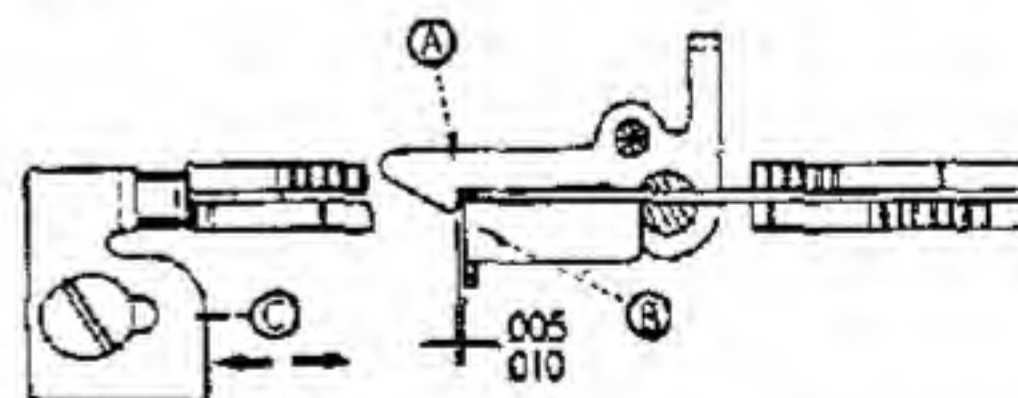
38. RIGHT HALF ACCUMULATOR CLEAR RACK: End of Rack A should clear Slot B in Carriage Frames .010 to .015. Adjust Bumper C.



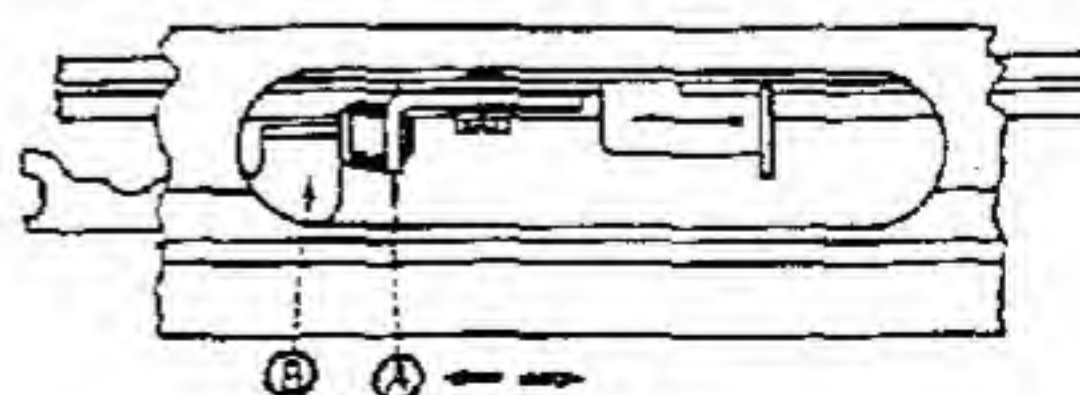
39. SPLIT CLEAR LOCK MECHANISM: Fig. 1. Dials Locked Position, upper end of Latch A should clear Notch on Slide B .002 to .008. Adjust by Eccentric C.

Fig. 2. In Unlocked Position, Slide B should clear under Lip on Latch A .005 to .010. Adjust by forming Slide B.

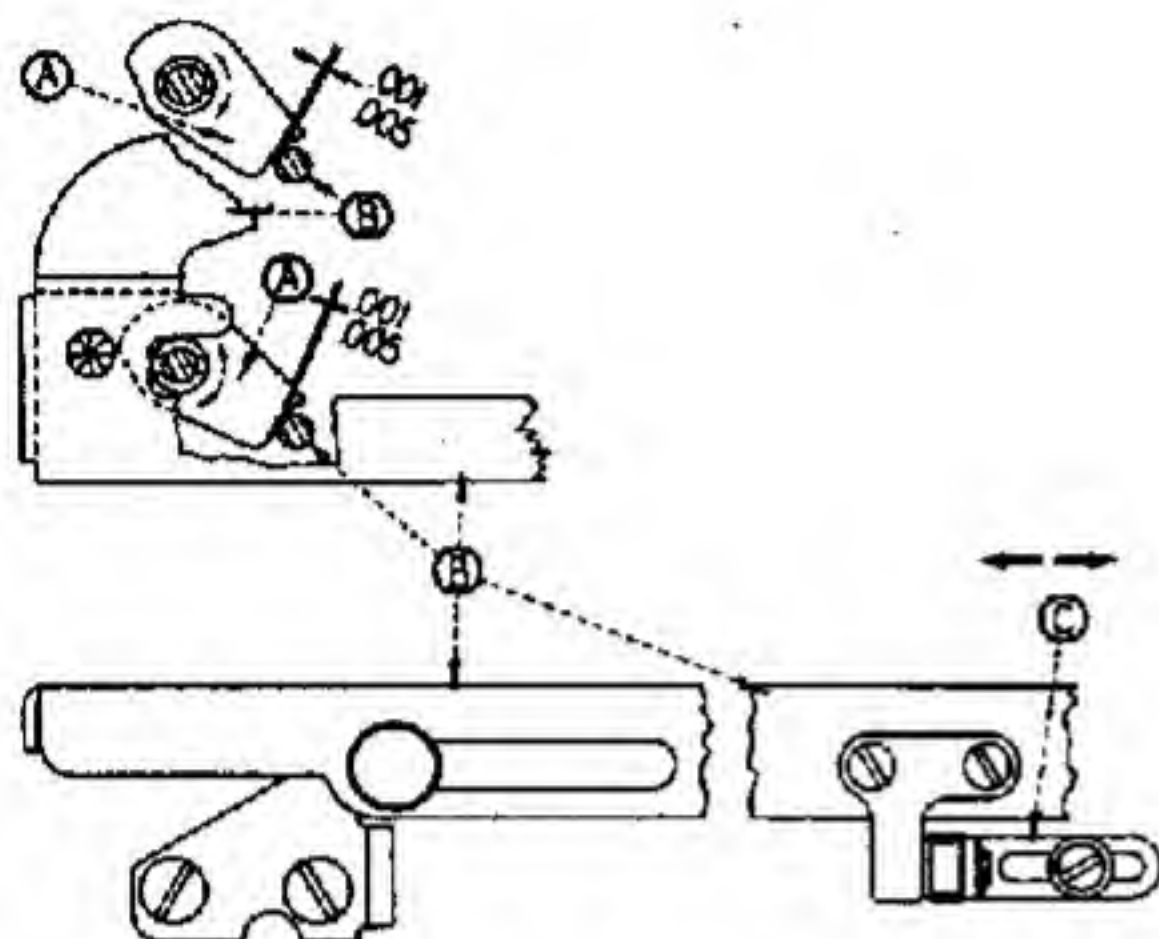
Fig. 3. Tail of Slide B should contact Slide Actuator D with full bite. Adjust by forming tail on Slide B.



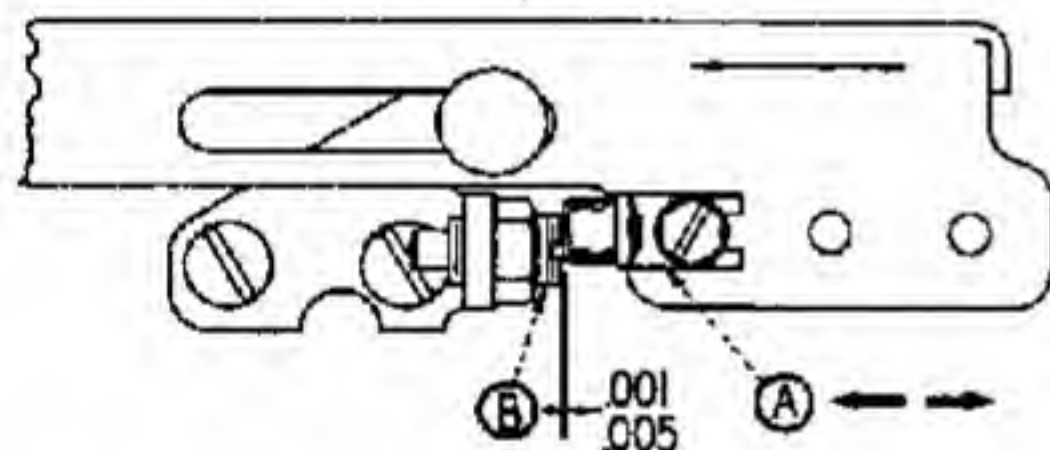
40. LEFT HALF ACCUMULATOR CLEAR RACK: In Home Position Latch A should overlatch Bracket B .005 to .010. Adjust Bumper C.



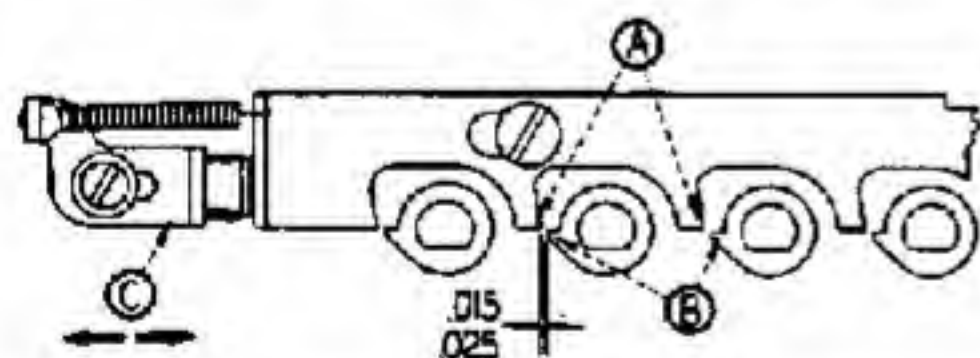
41. LEFT HALF ACCUMULATOR CLEAR RACK: In Clearing Position, there should be a slight amount of clearance between Bumper A and Stop B on Carriage at end of travel. Adjust Bumper A.



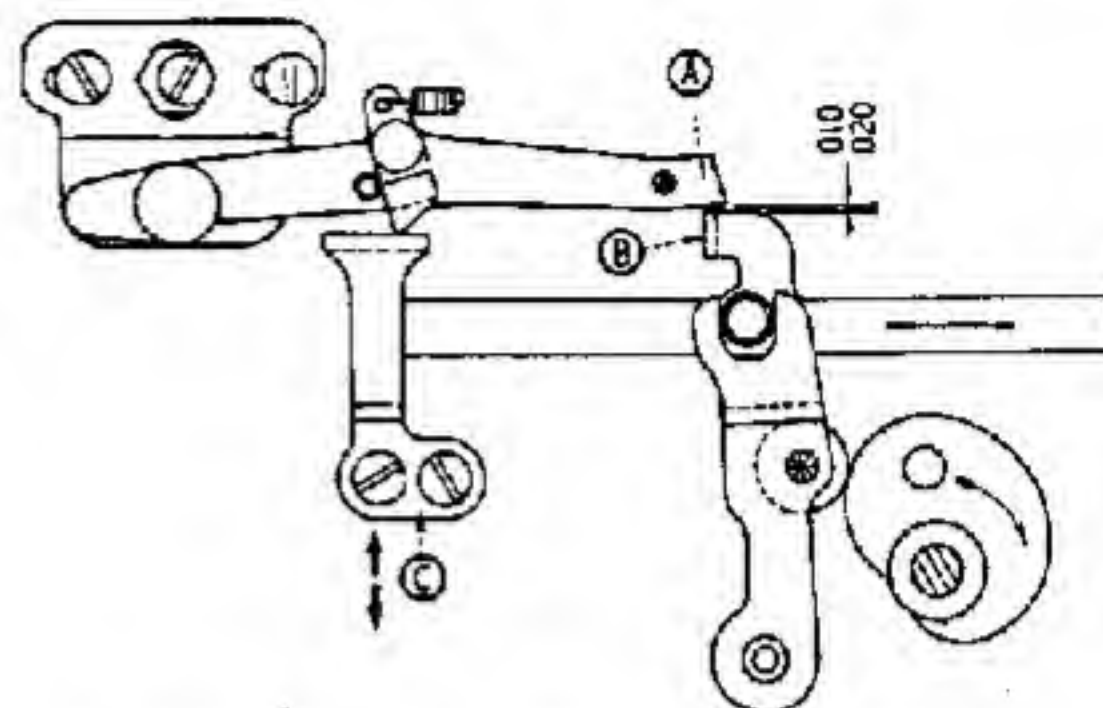
42. OPTIONAL CLEAR SLIDE ASSEMBLY: In Home Position, Optional Clear Latches A should be free to move in and out of position behind Studs on Slide B. Adjust Bumper C.



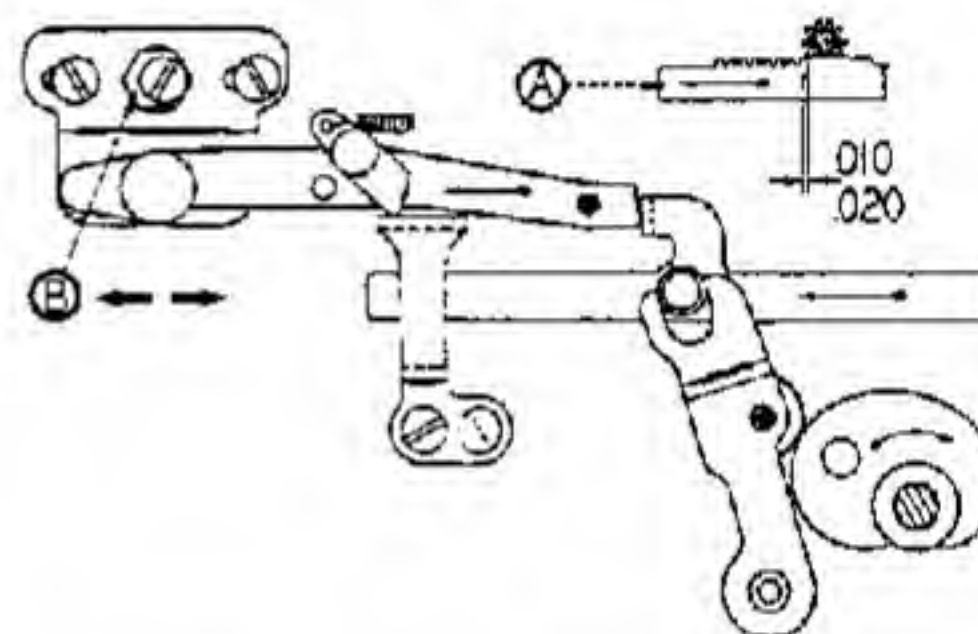
43. OPTIONAL CLEAR SLIDE, SECOND ADJUSTMENT: In Clearing Position, there should be a slight clearance between Bumper A and end of Screw B at end of travel. Adjust A.



44. ACCUMULATOR DIALS ZERO STOP SLIDE: In Home Position, there should be .015 to .025 clearance between points on Slide A and Zero Cam's B. Adjust Stop C.

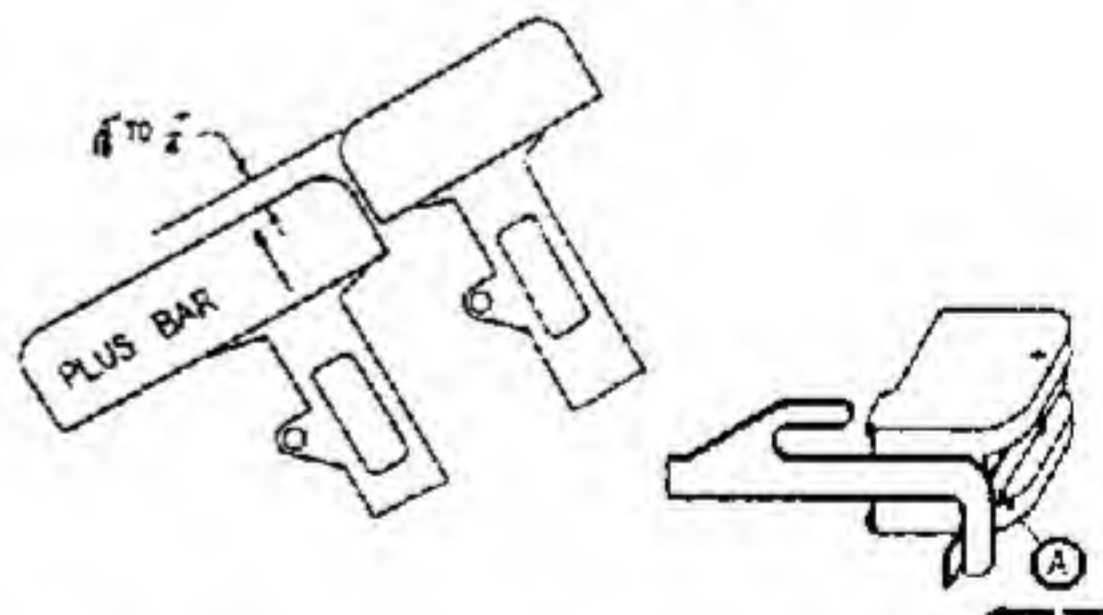


45. LAST ORDER POSITIONER: Return Clear Key depressed and Carriage shifting out of Second Position (handcrank). Clear Pawl A should clear Clear Slide B .010 to .020. Adjust Last Order Positioner C.

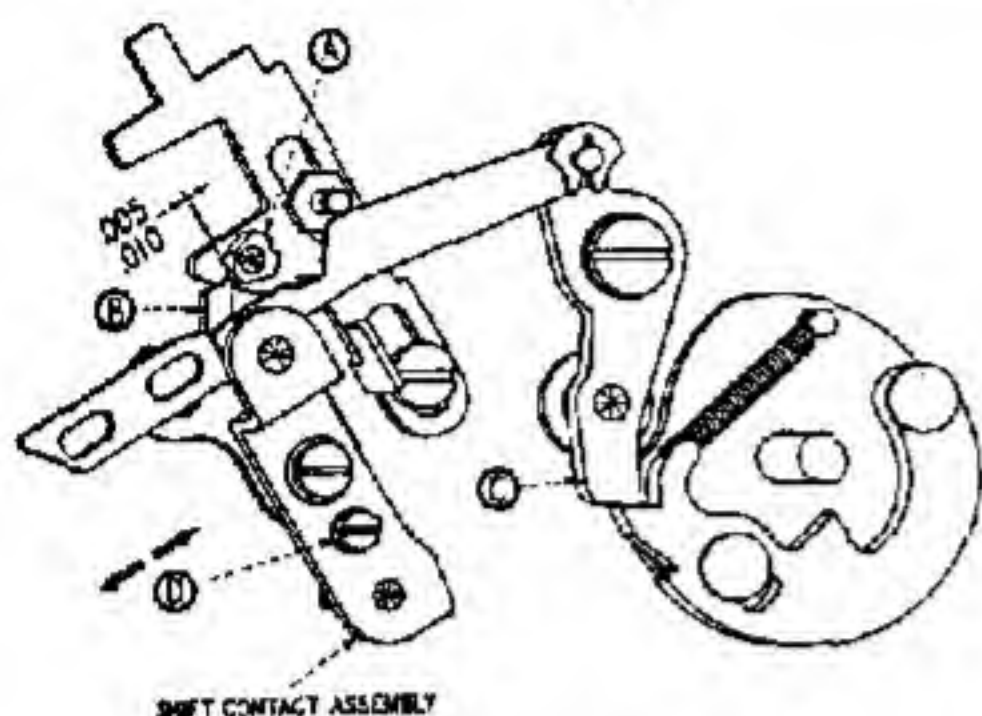


46. OPTIONAL AUTOMATIC CLEAR PAWL ASSEMBLY: With 9's in Accumulator Dials, depress Return Clear Key and turn slowly by handcrank. All 9's should clear out and there should be .010 to .020 overtravel of Accumulator Clear Rack A. Adjust Eccentric B.

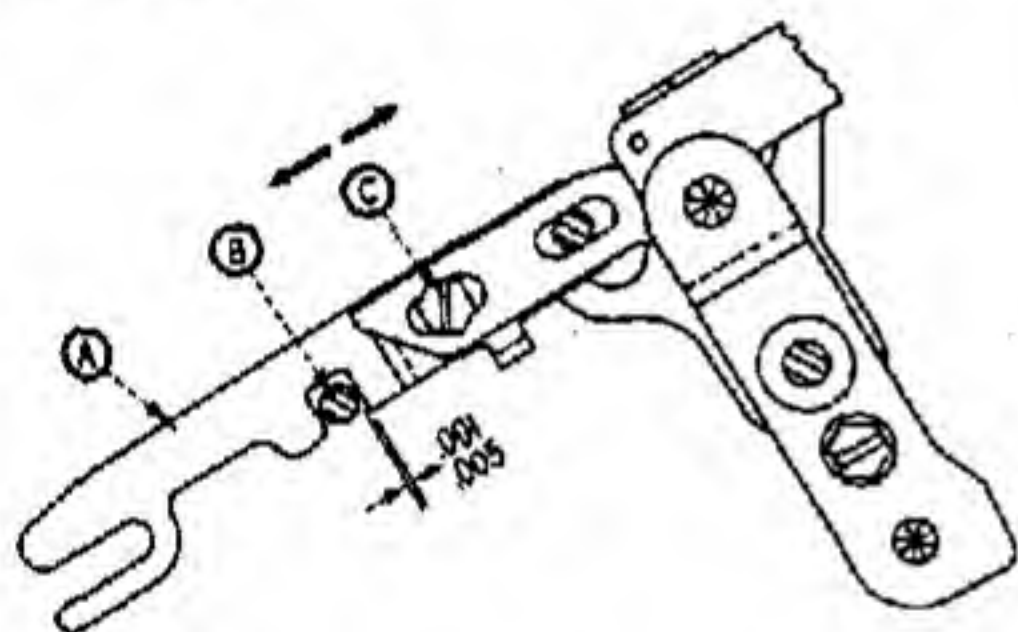
g. CONTROLS



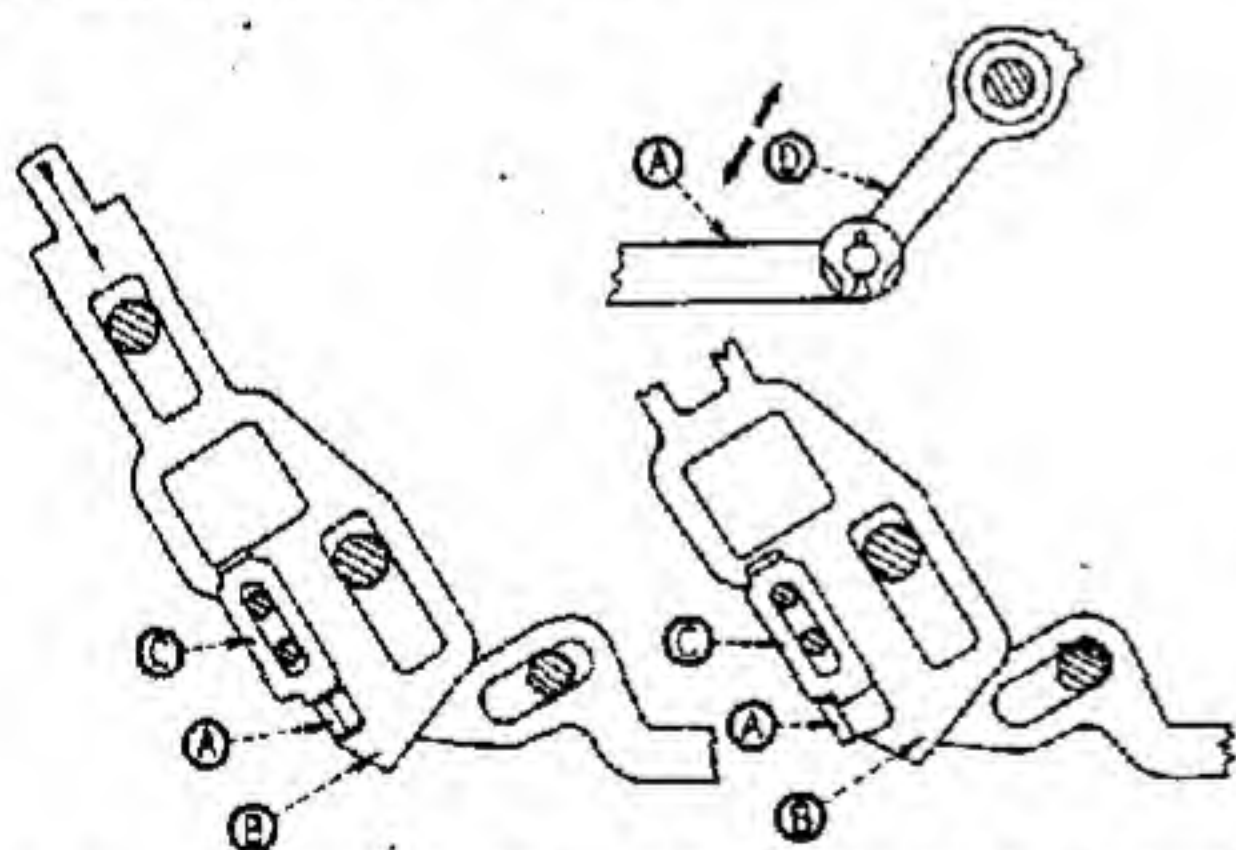
47. MICRO-SWITCH: Switch should make contact and motor should start well ahead of the release of the Clutch. As a check on this adjustment, motor should start when the Plus Bar is depressed $\frac{3}{16}$ " to $\frac{1}{4}$ ". Adjust by forming Switch Lever A.



48. LEVERS FOR SHIFT CONTACT ASSEMBLY: Point A should clear Point B .005 to .010 when Clutch Release Dog C is in Home Position. Adjust at Screw D.

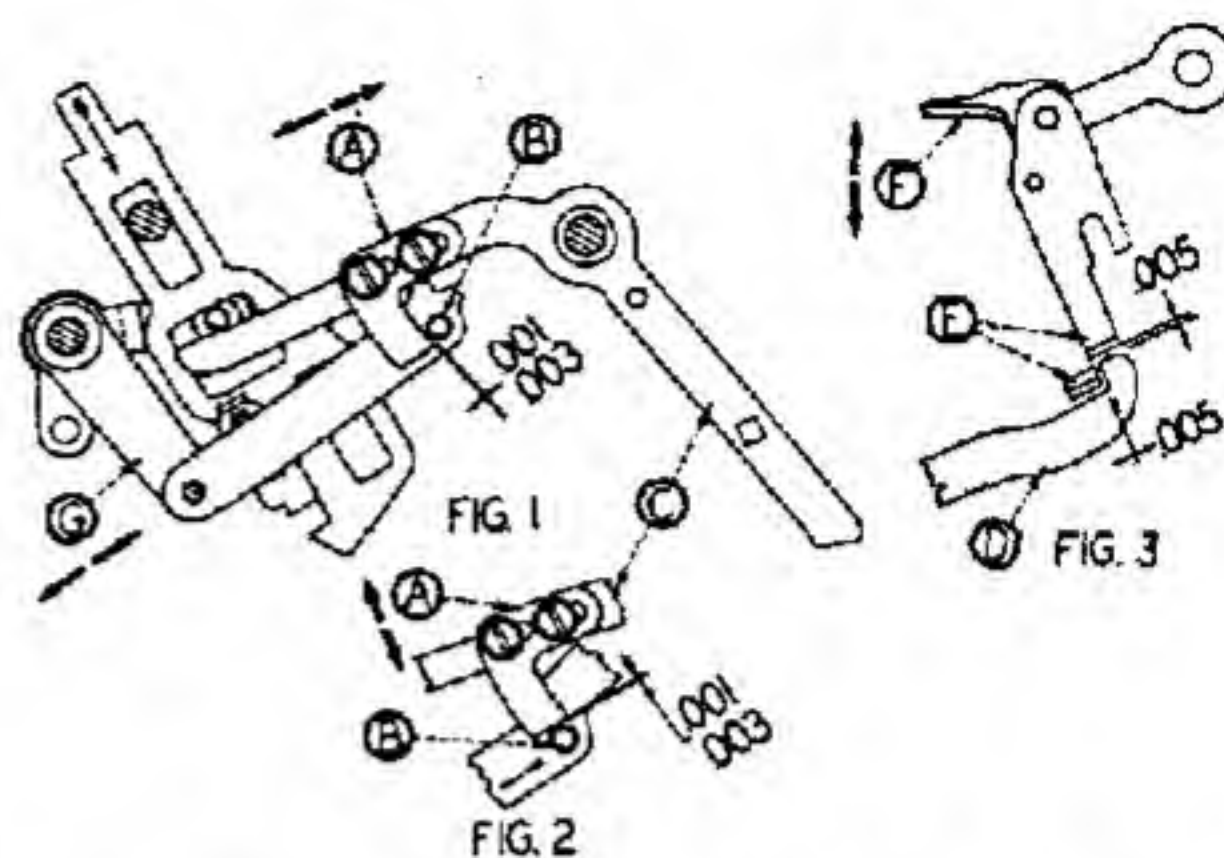


49. CLUTCH RELEASE LATCH, FRONT SECTION: Add Key down, depress Plus Bar and slowly release. Latch A should drop over Stud B on Clutch Release Slide, with .001 to .005 clearance on rear side of slot or approximately centered in slot. Adjust at Screw C.



50. CARRIAGE CLEAR KEY: Key Latch A should have approximately 100% bite when Key B is depressed. Key Latch Block Slide C should remain on top of Latch Lip A in this position; and when Clear Action is completed, should drop behind Latch Lip to disable Latch A if Key B is held down. Adjust by forming Linkage D at rear end of Latch A.

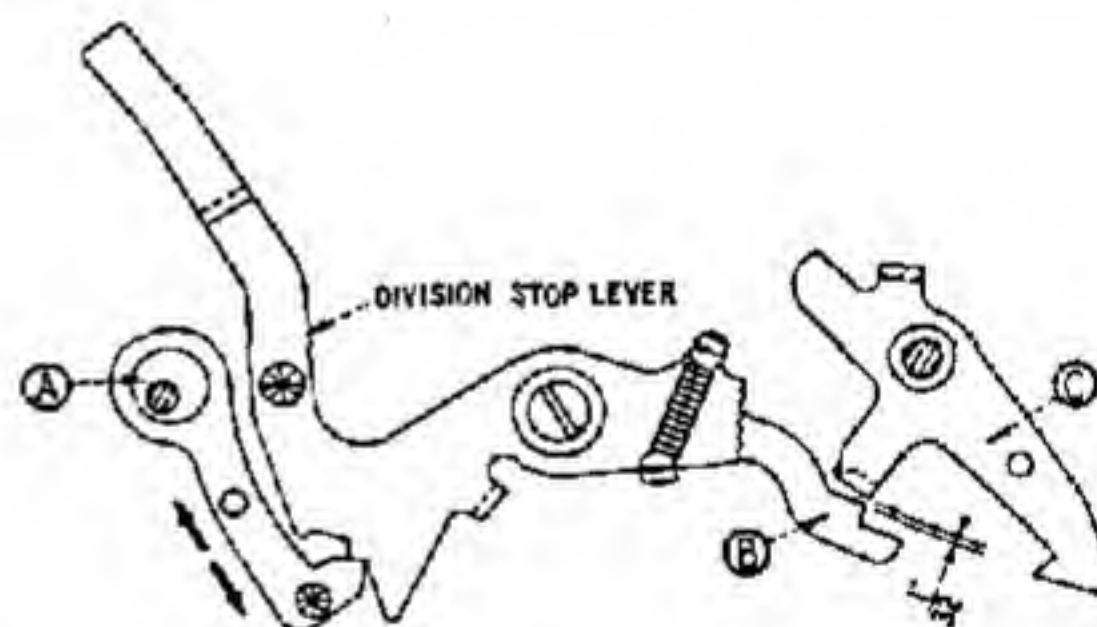
51. RETURN CLEAR BELL CRANK ASSEMBLY: Fig. 1. Carriage Clear Key depressed, Interlock



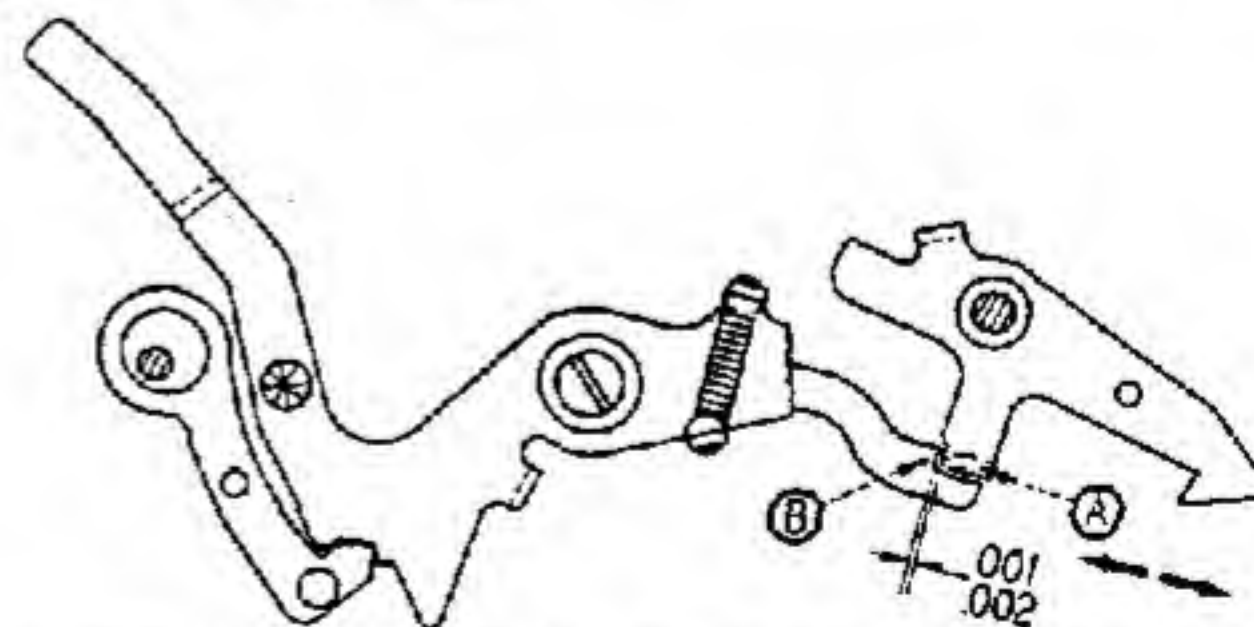
Lever A should clear Stud B .001 to .003. Adjust Lever A.

Fig. 2. With a Multiplier Key depressed, Stud B should clear Lever A .001 to .003. Adjust Lever A or form Bell Crank C.

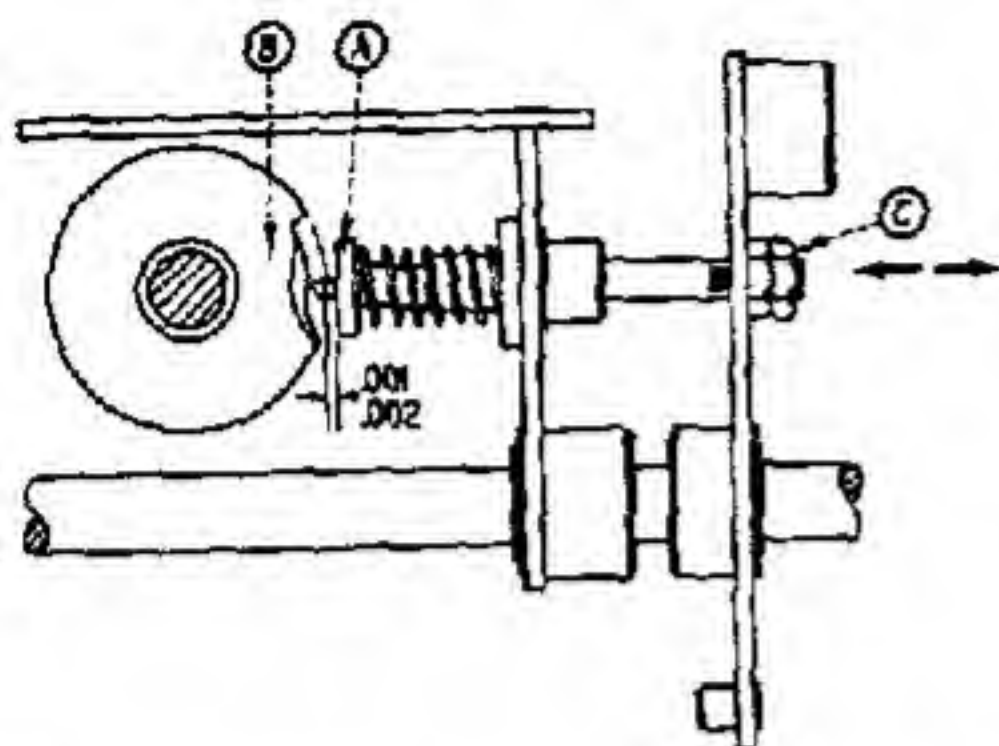
Fig. 3. With a Multiplier Key depressed, Interlock Link D should clear under Lip of Interlock Blocking Lever E a minimum of .005. Adjust at F. With Dividend Tabulator Key depressed, Lip on E should clear D a minimum of .005. To obtain more clearance form Lever G rearward, Fig. 1.



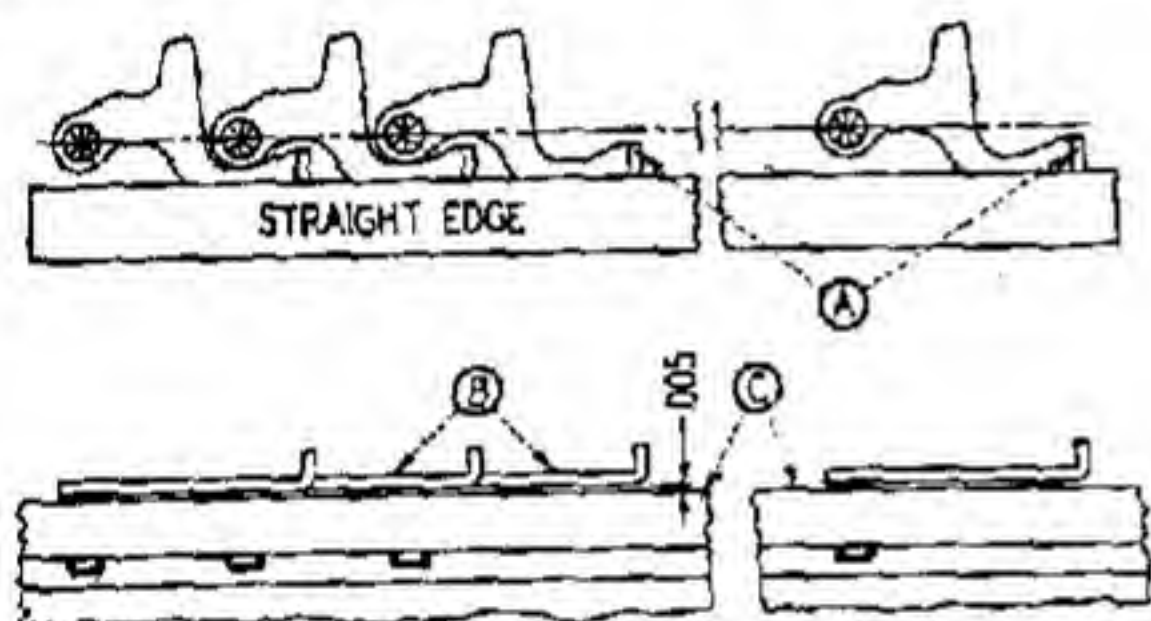
52. DIVISION STOP LEVER: In Normal Position, there should be approximately 1/32" clearance between Live Point B and Division Latch C. Adjust at Eccentric A.



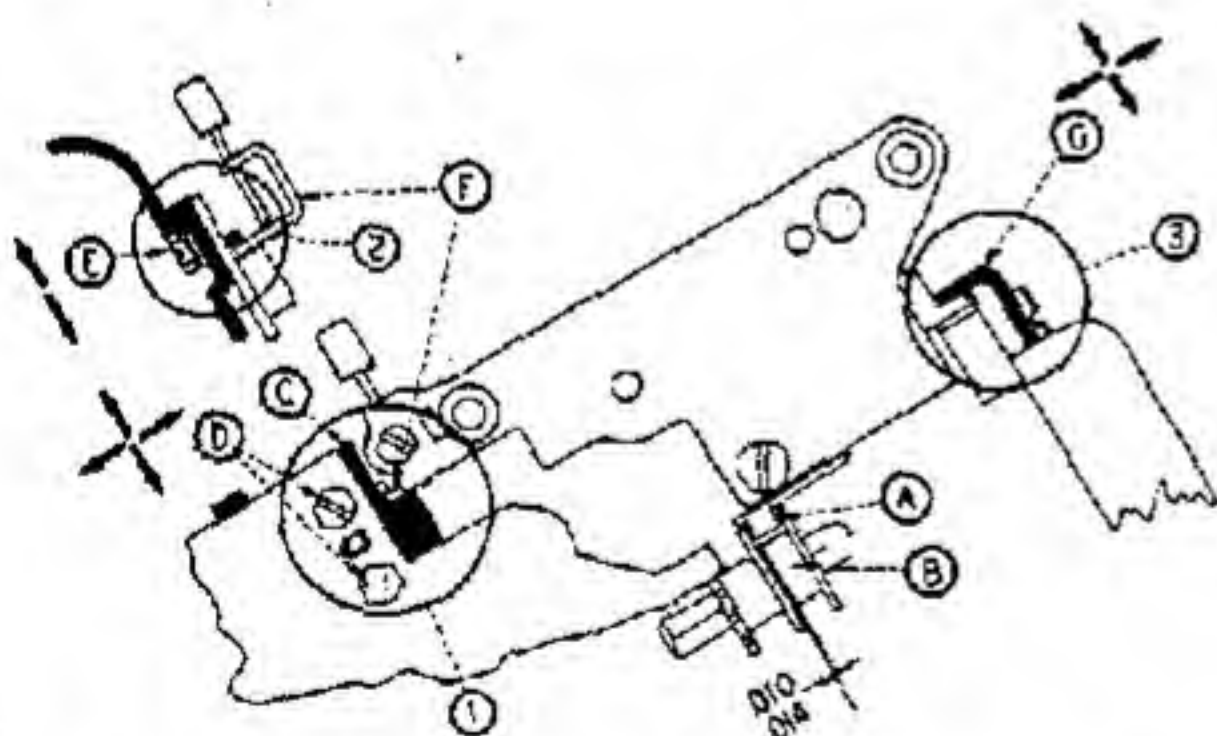
53. DIVISION LATCH: With Division Stop Lever in DOWN position Step on Latch A should clear Live Point B .001 to .002 when Division Control Arm is in Add Stroke in Division. Adjust by forming Step A.



54. PIN FOR CYCLE LOCK: With Add-Subtract Gate in Plus or Minus Position, Disc A on Cycle Lock Pin should clear Disc B on #1 Actuator .001 to .002. Adjust at C.



55. TRANSFER LEVERS: Front edges of Transfer Lever Lips A should be in a straight line parallel to Carriage Frames. Use straight edge for checking. Transfer Levers B should not catch on edge of Carriage Frame C when moved out and in. Bottom edges of Transfer Levers B may not be in perfect alignment, but this is acceptable.

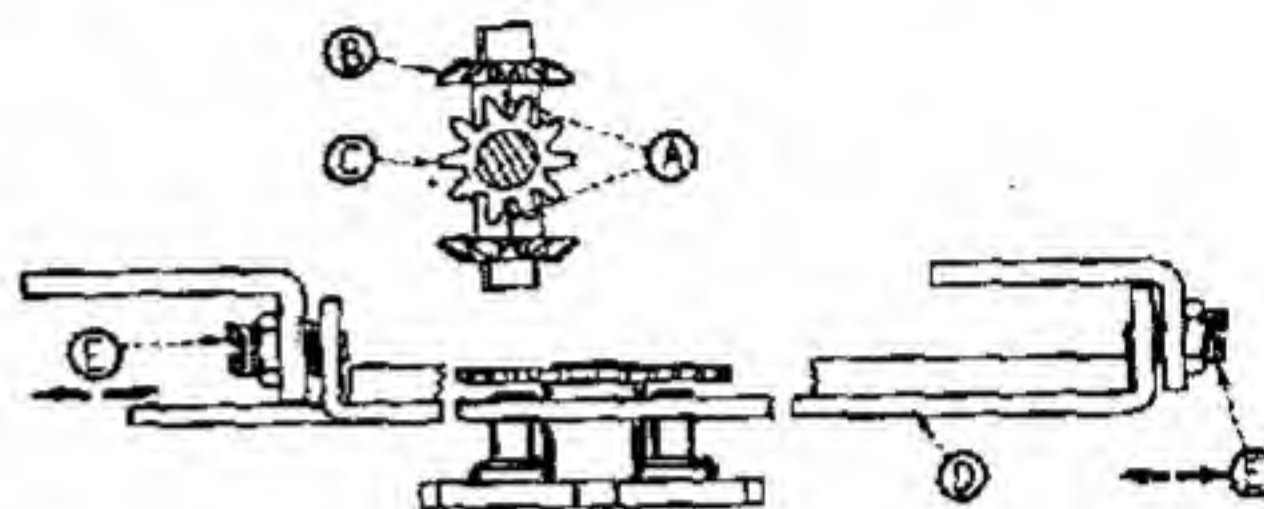


56. CARRIAGE SETTING: There should be .010 to .014 clearance between Transfer Levers A and Transfer Gears B, as shown. Check Carriage at both ends. Carriage should be free running, without excess play at any point either front to rear or up and down. To adjust, there are three steps: Step 1. Adjust Brace C at Screws D at both ends. Holes in Right Frame are slotted for forward and rearward adjustment only; holes in Left Frame are enlarged for forward and rearward as well

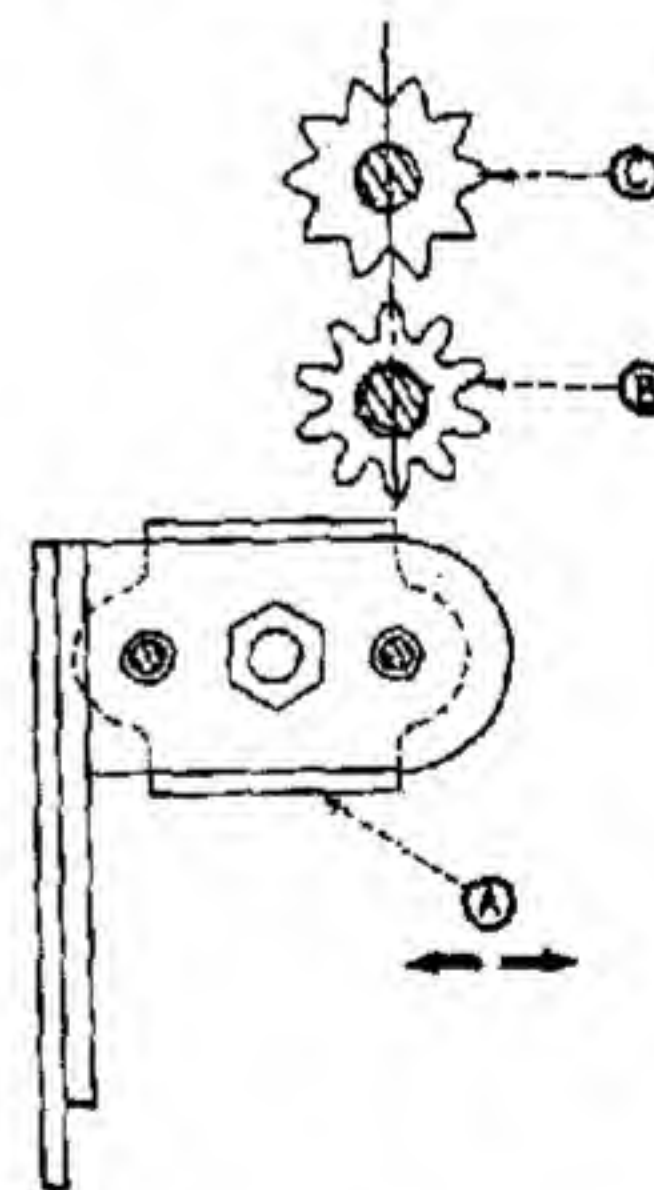
as up and down for leveling to Front Carriage Rail F.

Step 2. Adjust Bracket E to remove up and down play at Front Rail F.

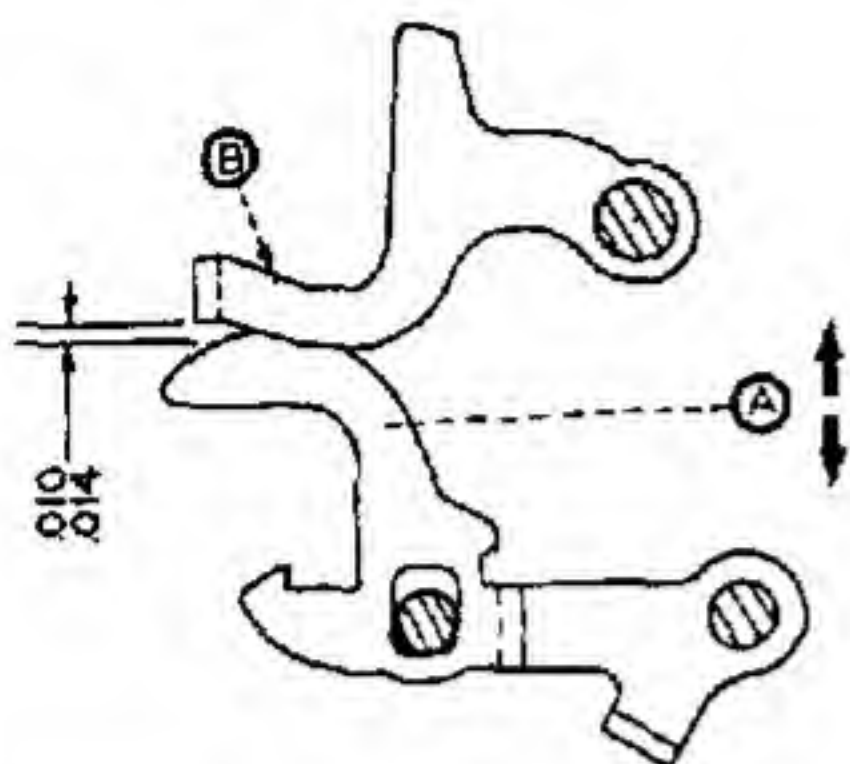
Step 3. Adjust Rear Carriage Retainers G by filing or peening so Carriage is free running without excess play at any point, either up and down or forward and rearward.



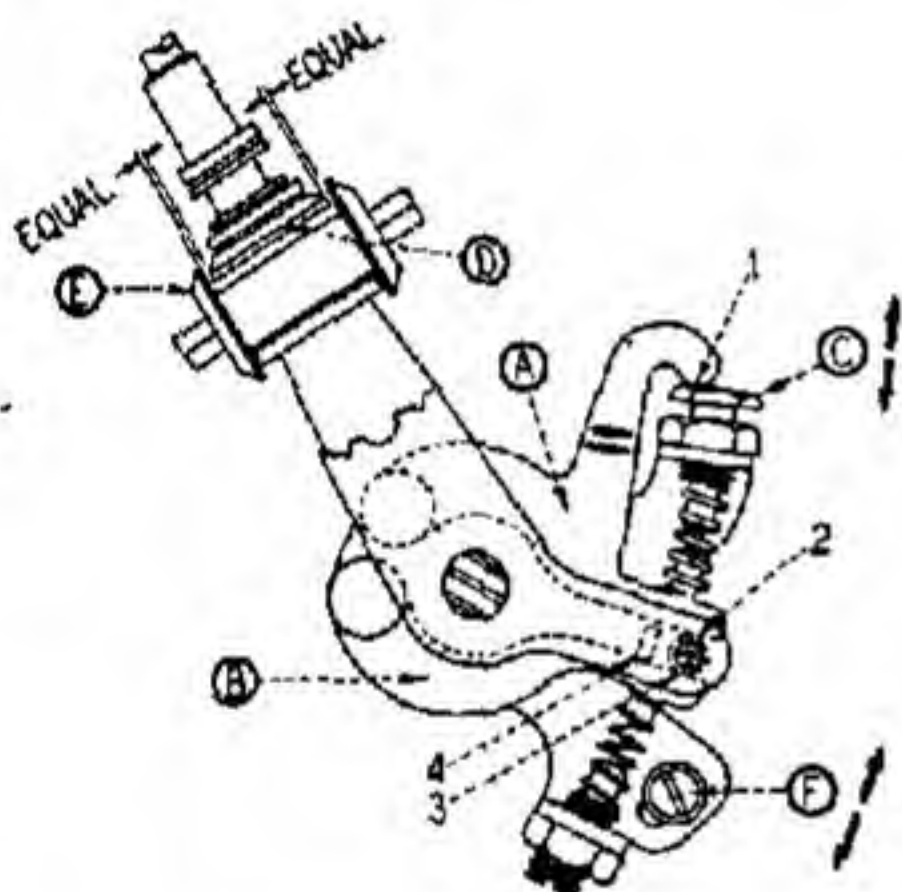
57. CARRIAGE SHIFT RACK: There should be perfect mesh at points A of Add-Subtract Gears B with Product Dial Gears C in both Plus and Minus operations. With Key Board clear, test by operating Plus and Minus Bars in rapid succession. If Dials show movement, adjust Rack D to right or left, as necessary, at E. There should be no end play in Rack D. Carriage should be in second or third position when making test.



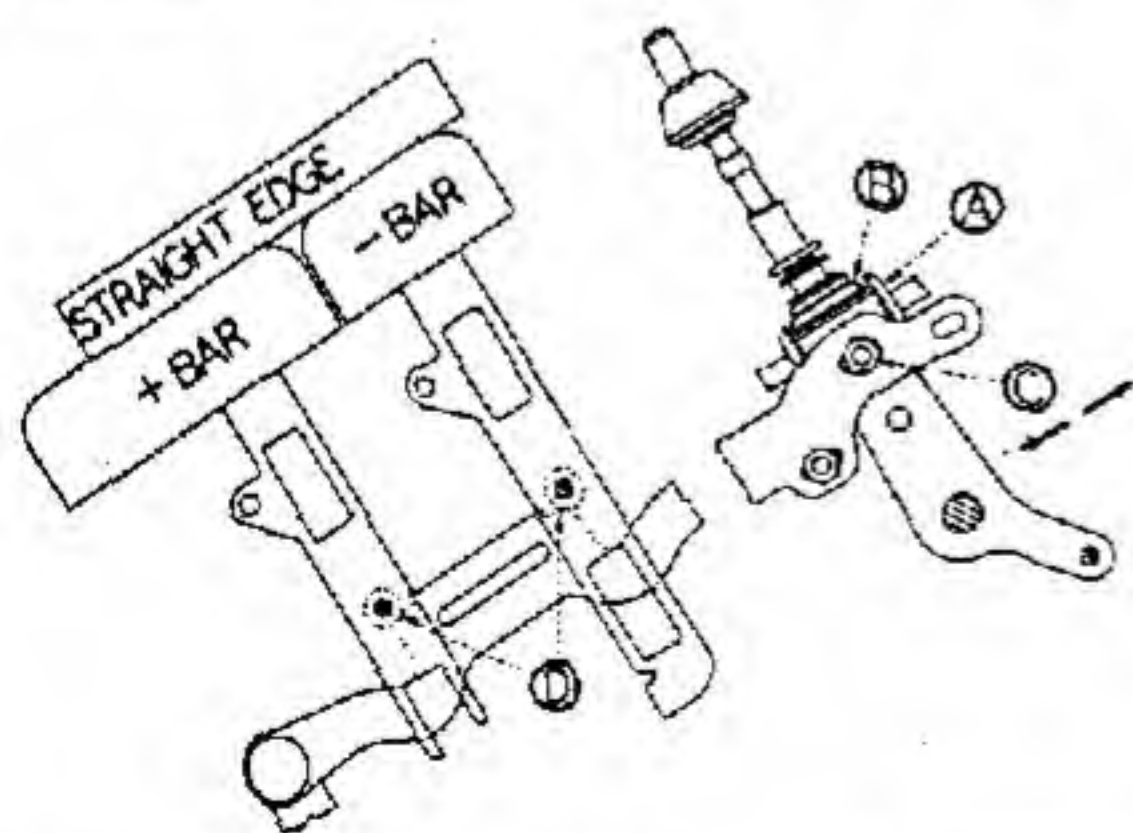
58. EXTRA TRANSFER SHAFTS BEARING: Product Dials should not show movement in either Plus or Minus operation. If movement is noted, adjust Bearing A to right or left so there is perfect mesh of Add-Subtract Gears B with Product Dial Gears C.



59. SPRING TRANSFER LATCH: There should be .010 to .014 clearance between Latch A and Transfer Lever B, as shown. Adjust by forming Latch at A.



60. ADD-SUBTRACT GATE CENTRALIZER: In Normal Position, Arms A and B should have four points of contacts as shown. Adjust Screw C. In Normal Position, there should be equal clearance between both sides of Product Dial Gears D and Add-Subtract Gears E. Adjust at F.



61. DIRECTION CONTROL SLIDE ASSEMBLY FOR PLUS AND MINUS: There should be equal mesh of Add-Subtract Gears A with Product Dial Gears B in both Plus and Minus operations. To

adjust, loosen nut on Adjusting Screw Stud C and depress Plus and Minus Bars, using a straight edge, as shown; with equal contact of Rollers on Control Slide as shown at D, tighten Nut C. Check adjustment by first depressing the Plus Bar, then the Minus Bar, rotating Drive Shaft by handcrank. Point of Cycle Lock Pin should clear Cycle Lock Disc on #1 Actuator an equal amount in both operations.

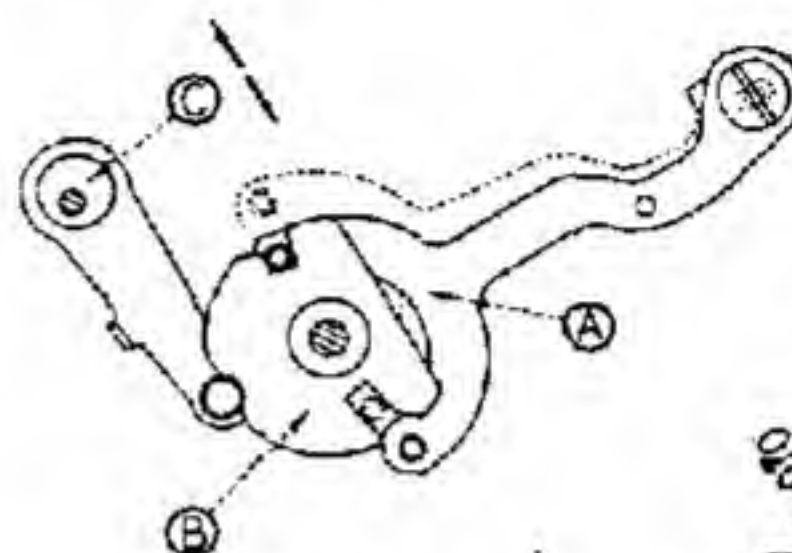


FIG. 1

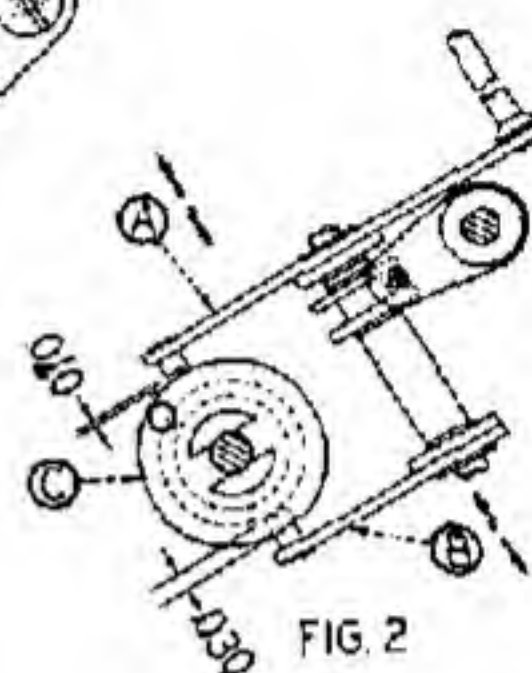
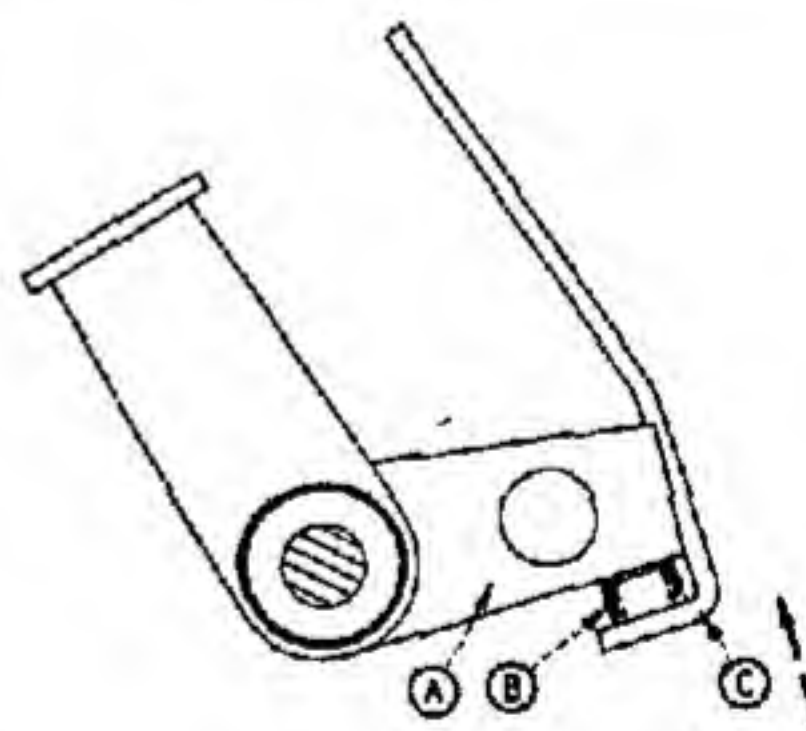
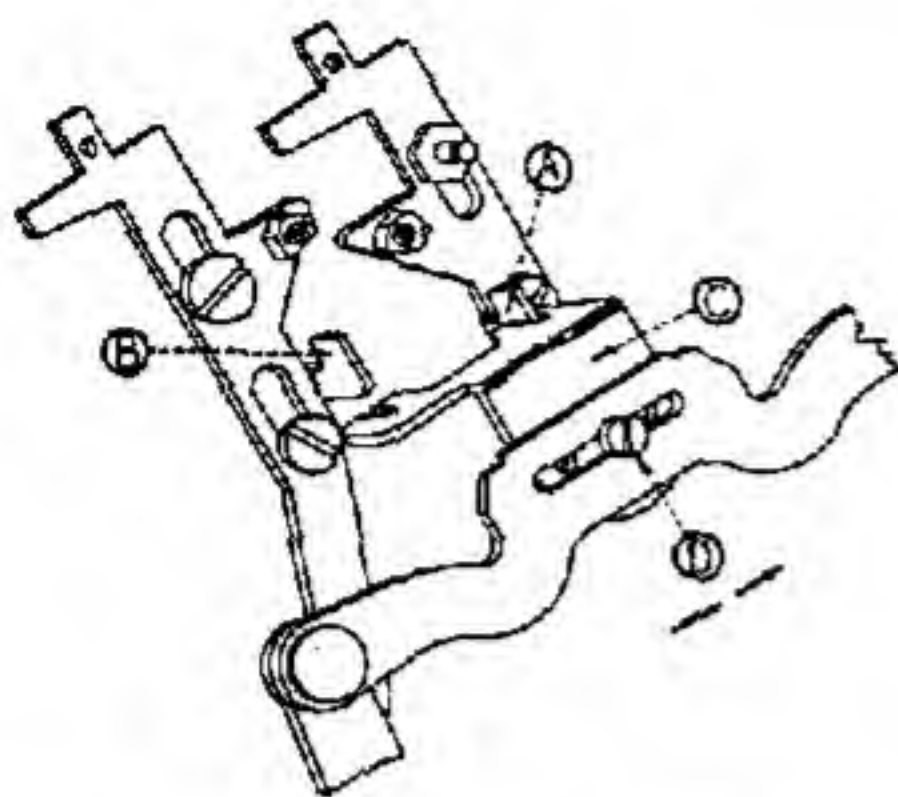


FIG. 2

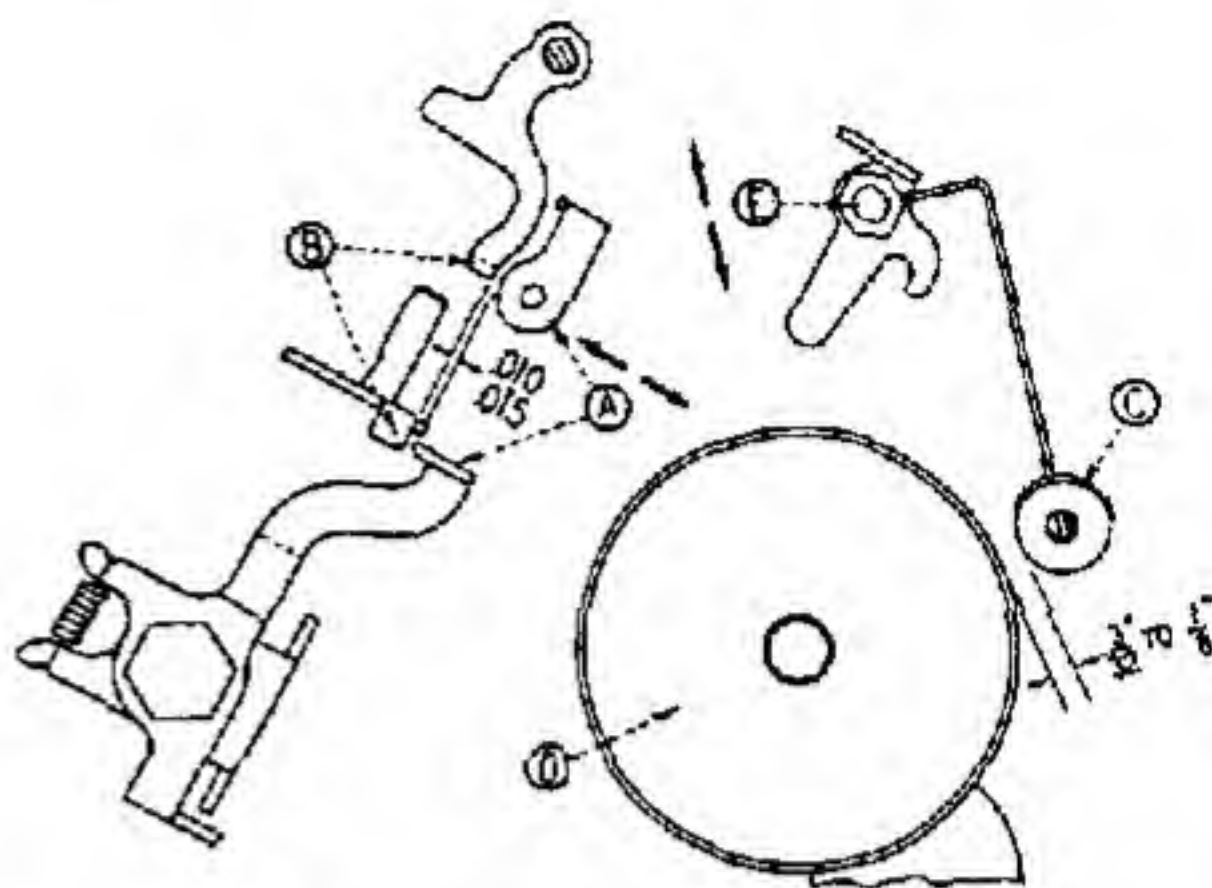
62. CENTRALIZER ARM FOR COUNTER REVERSE: Fig. 1. Studs on Reverse Lever A should have equal clearance in both upper and lower slots in Reverse Disc B. Adjust Eccentric C. Fig. 2. In Normal Position Arms of Counter Oscillator A and B should be positioned so Stud in B is engaged in Cam C approximately .030 and Stud in Arm A has .010 clearance. Adjust by forming A and B.



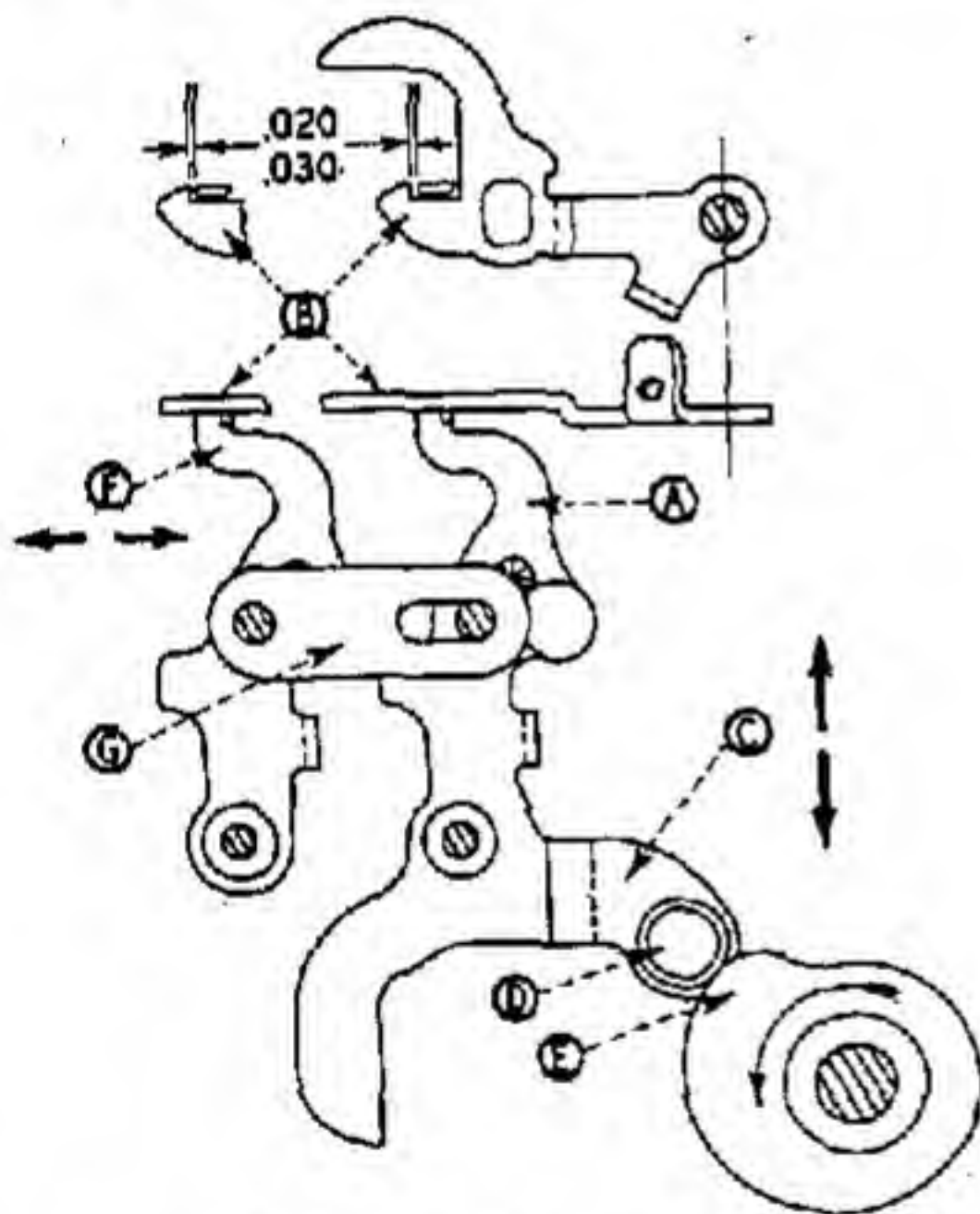
63. ADD-SUBTRACT GATE BUMPER ARM: With Plus Key bottomed, Bumper Arm A should contact Bumper B without pressure. Adjust by forming Bracket at C.



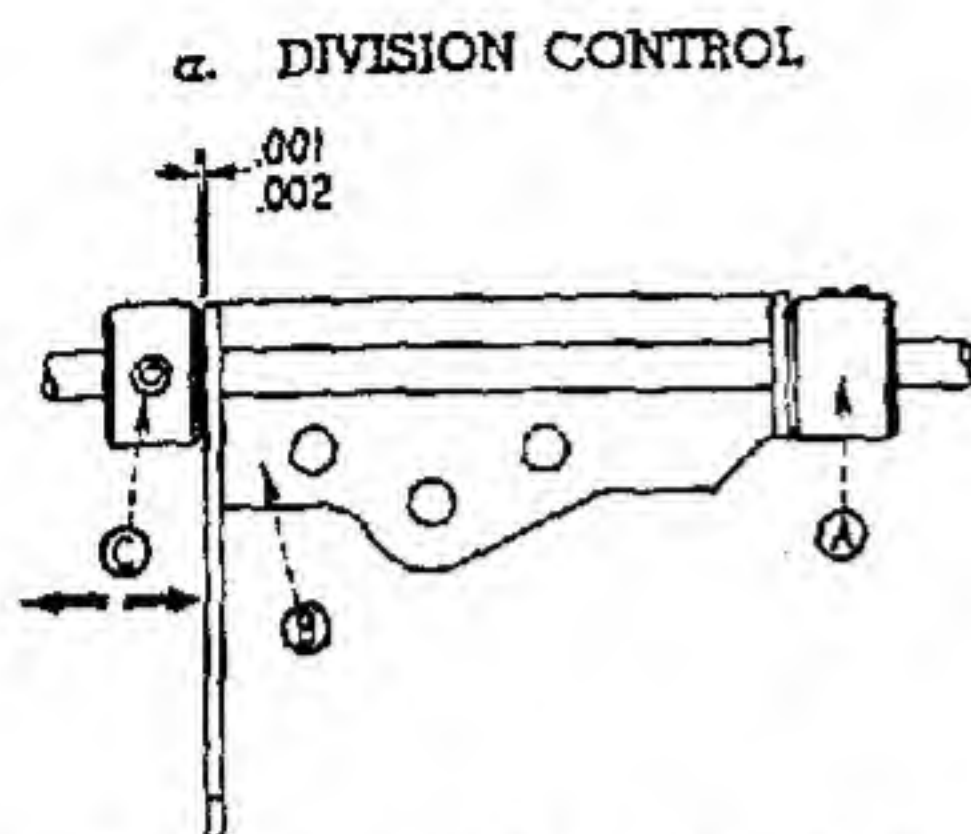
64. SHIFT KEYS INTERLOCK: With Add-Subtract Gate centralized, Interlock Lips on Shift Keys A and B should move freely in slots in Interlock C. To adjust, depress upper or Left Shift Key A and adjust at D. Lower or Right Shift Key B should then line up with lower slot in C; if not, adjust by forming Lip B.



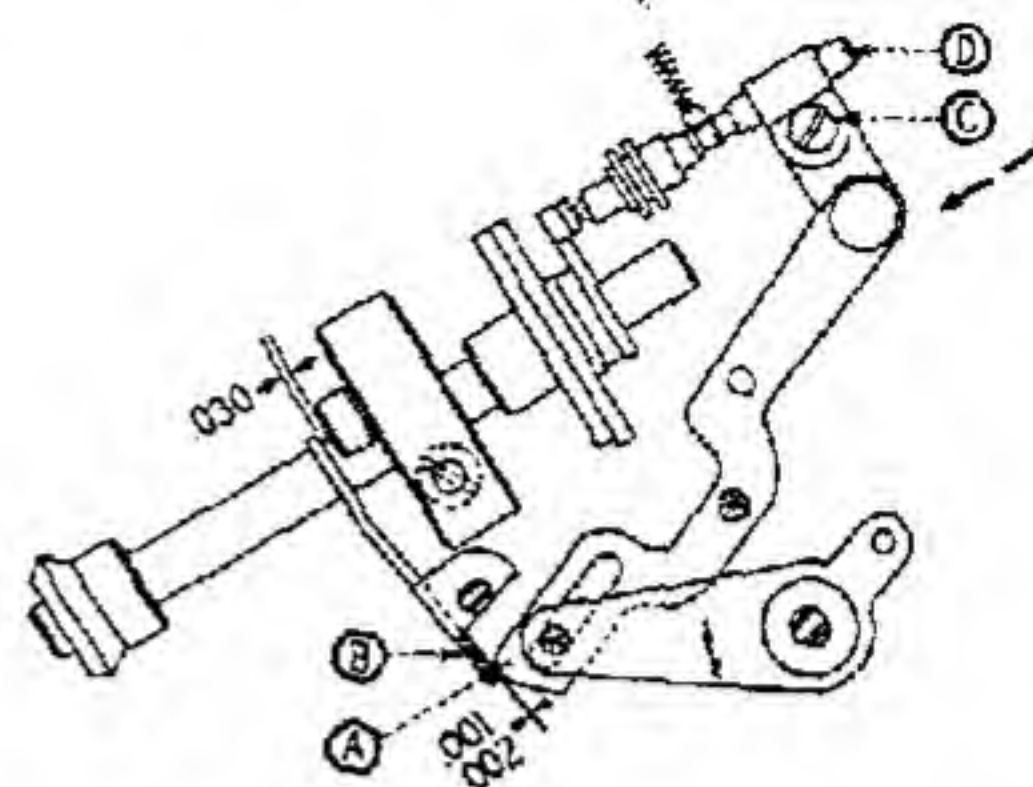
66. BELL TAPPER ASSEMBLY: Upper end of Lever A should clear Transfer Lever B .010 to .015. Adjust by forming Lever A. Tapper C should clear Bell D $3/32''$ to $1/8''$. Adjust Clamp E.



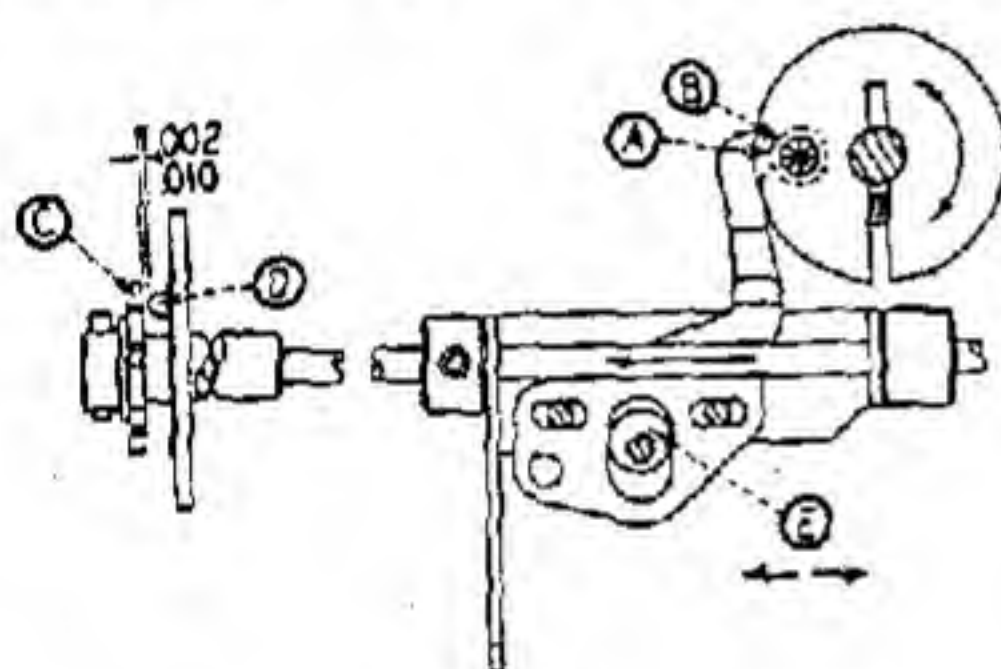
65. SPRING TRANSFER MECHANISM: Lever A should have .020 to .030 overlatch on Latch B. Adjust by forming at lower end of A at C to raise or lower Roller D where it comes in contact with Restore Cam E on #6 Actuator. Lever F should have approximately the same amount of overlatch. Check Connecting Link G for wear, or adjust at upper end.



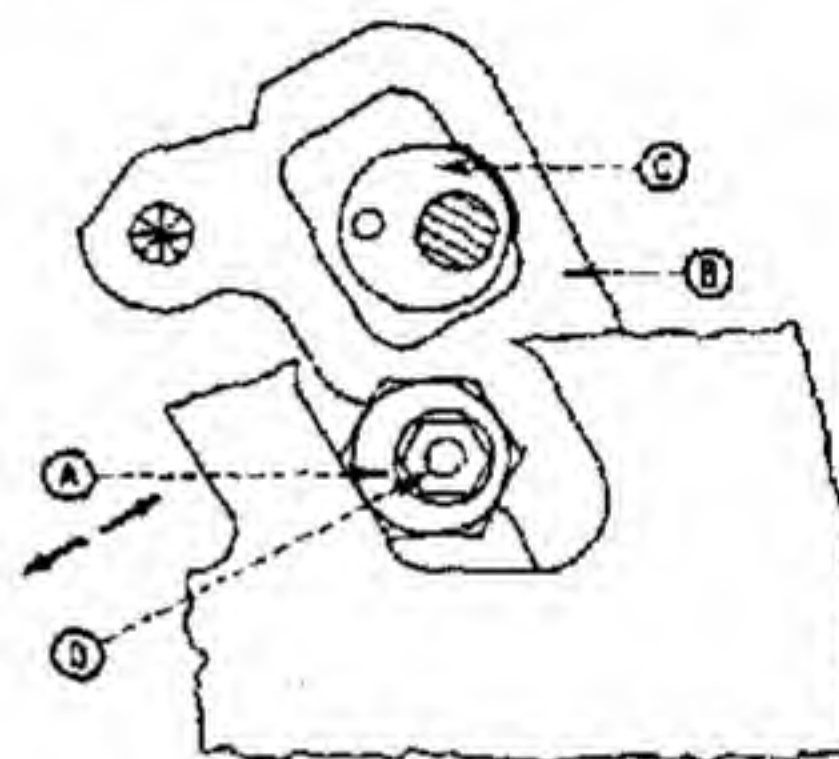
67. DIVISION THROWOUT BAIL: Cam A on left end of Shaft is a fixed position. Bail B should be free, and there should be .001 to .002 clearance between B and Clamp C. Adjust by Clamp C.



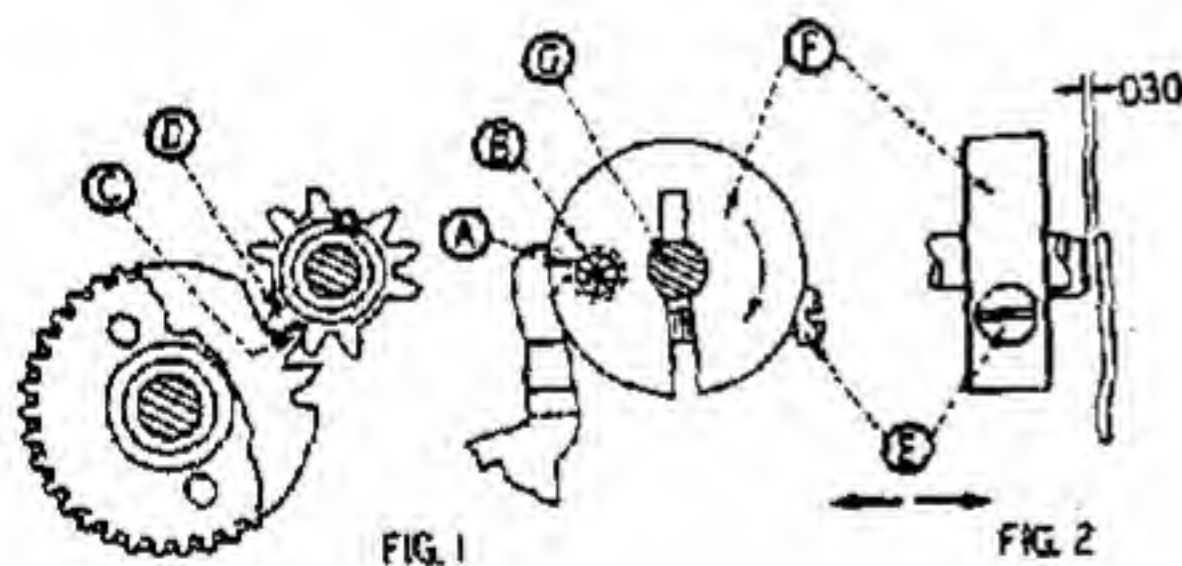
clearance between lower end of Connector Arm A and Throwout Actuator B. Adjust Clamp C on Long Transfer Pin D.



68. DIVISION THROWOUT ACTUATOR: When Point A is on high point of Roller B, Control Gear C should clear Pin D .002 to .010. Adjust at Eccentric E.



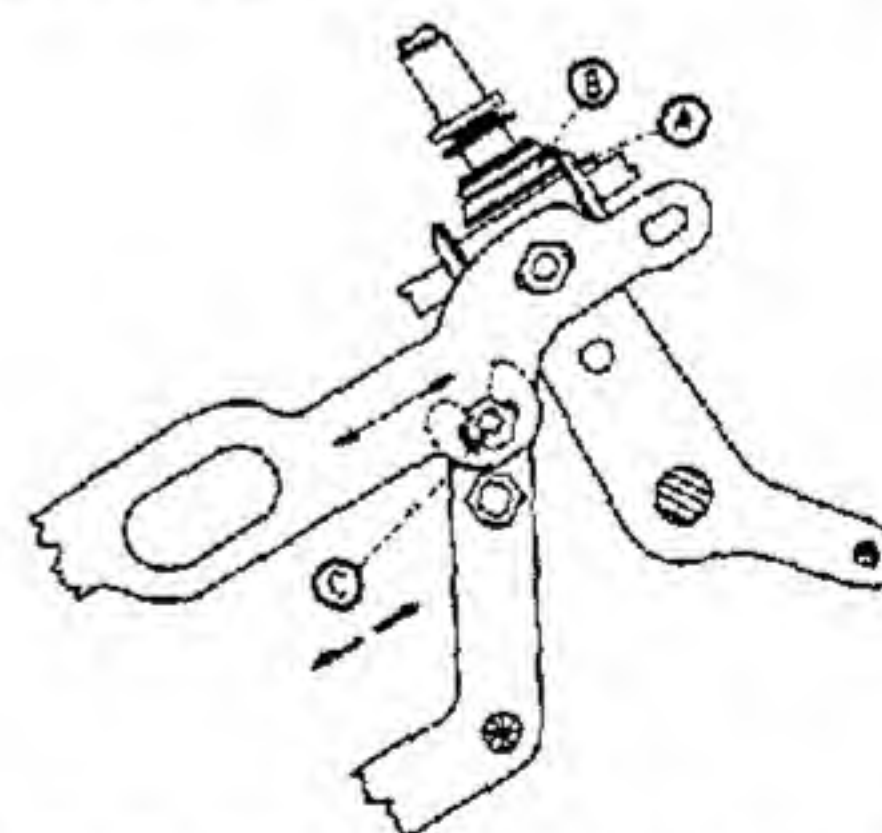
71. ECCENTRIC STOP FOR DIVISION CONTROL ARM: Machine in Home Position, Stop A should hold Division Control Arm B so Division Control Cam C is free to move in and out without binding on Arm B. To adjust, loosen Nut D and turn Stop A.



69. CAM FOR DIVISION THROWOUT: Fig. 1. As Point A of Throwout Actuator reaches high point on Roller B, first tooth of Intermittent Gear C should contact tooth of Division Control Gear D, as shown. To adjust, loosen Screw E and rotate Cam F on Shaft G.

Fig. 2. When making the above adjustment, note the .030 clearance between Actuator A and Roller B in Normal Position. Adjust by sliding Cam F up or down on Shaft G.

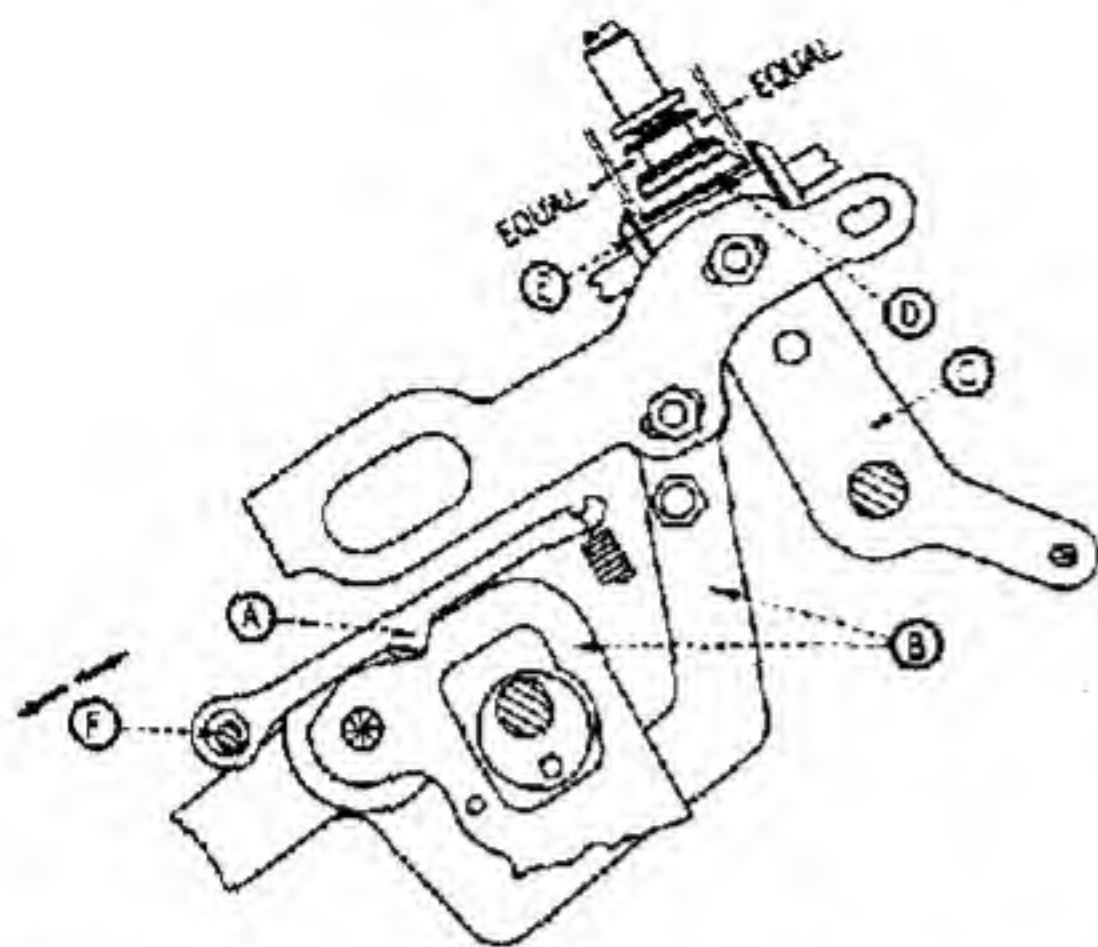
70. CONNECTOR ARM, DIVISION THROWOUT: In Normal Position, there should be .001 to .002



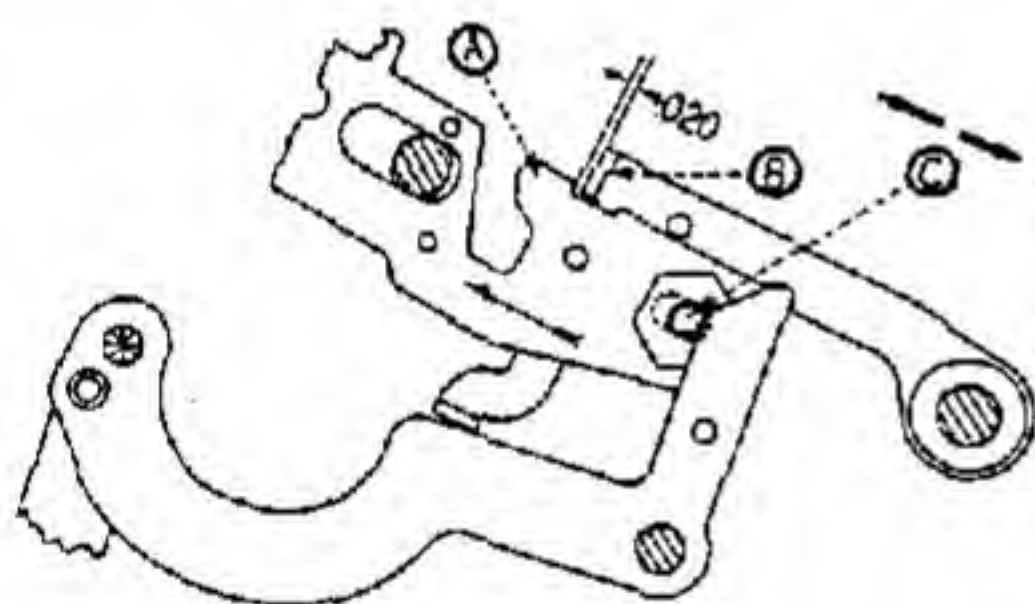
72. DIRECTION CONTROL SLIDE, DIVISION: Machine in Division, there should be equal mesh of Add-Subtract Gears A with Product Dial Gears B in both Add and Subtract positions. Adjust at Nut C. To check adjustment, operate machine in Division with handcrank; there should be equal clearance between Point on Cycle Lock Pin and Disc on #1 Actuator in both Add and Subtract Positions.

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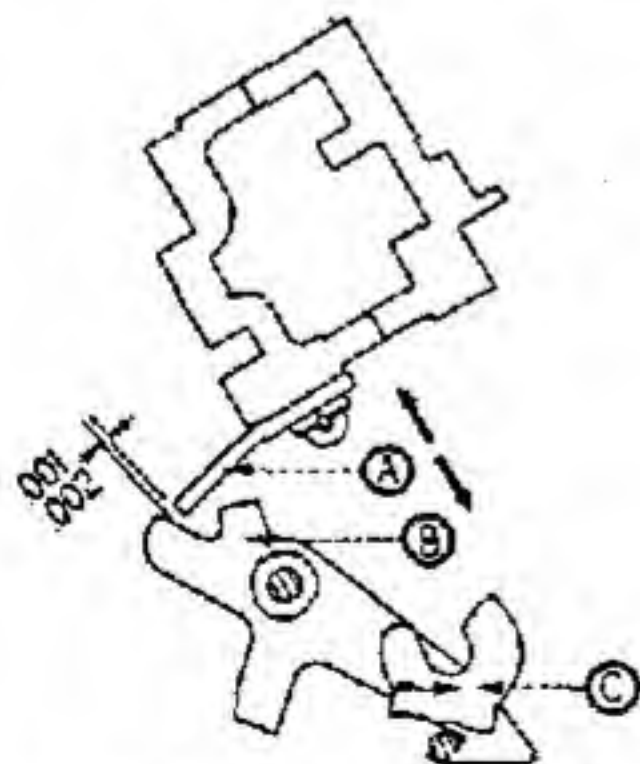
DIVISION ADJUSTMENTS



73. CENTRALIZER ARM FOR DIVISION CONTROL ARM: Machine in Division Shift Operation. Arm A should hold Division Control Arm B so Add-Subtract Gate C is perfectly centralized and there is equal clearance between both sides of Product Dial Gears D and Add-Subtract Gears E. Adjust by Eccentric Screw F. NOTE: Keep Point A greased.

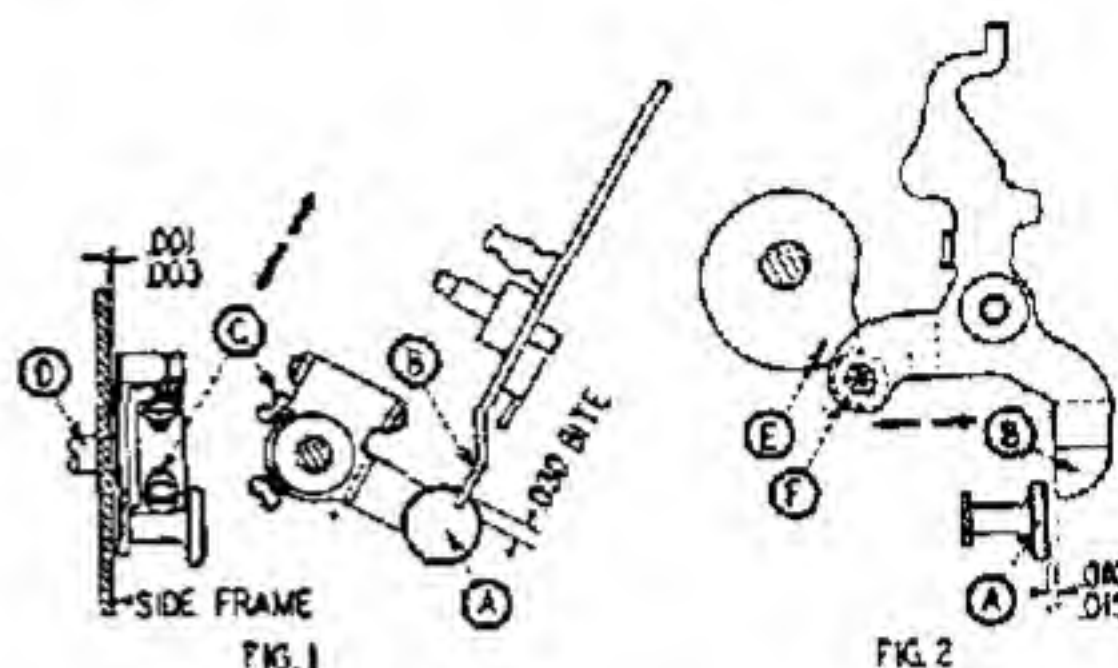


74. CLUTCH RELEASE SLIDE, DIVISION: When Division is tripped, Slide A should overlatch on Latch B approximately .020. Adjust at Screw Stud C.



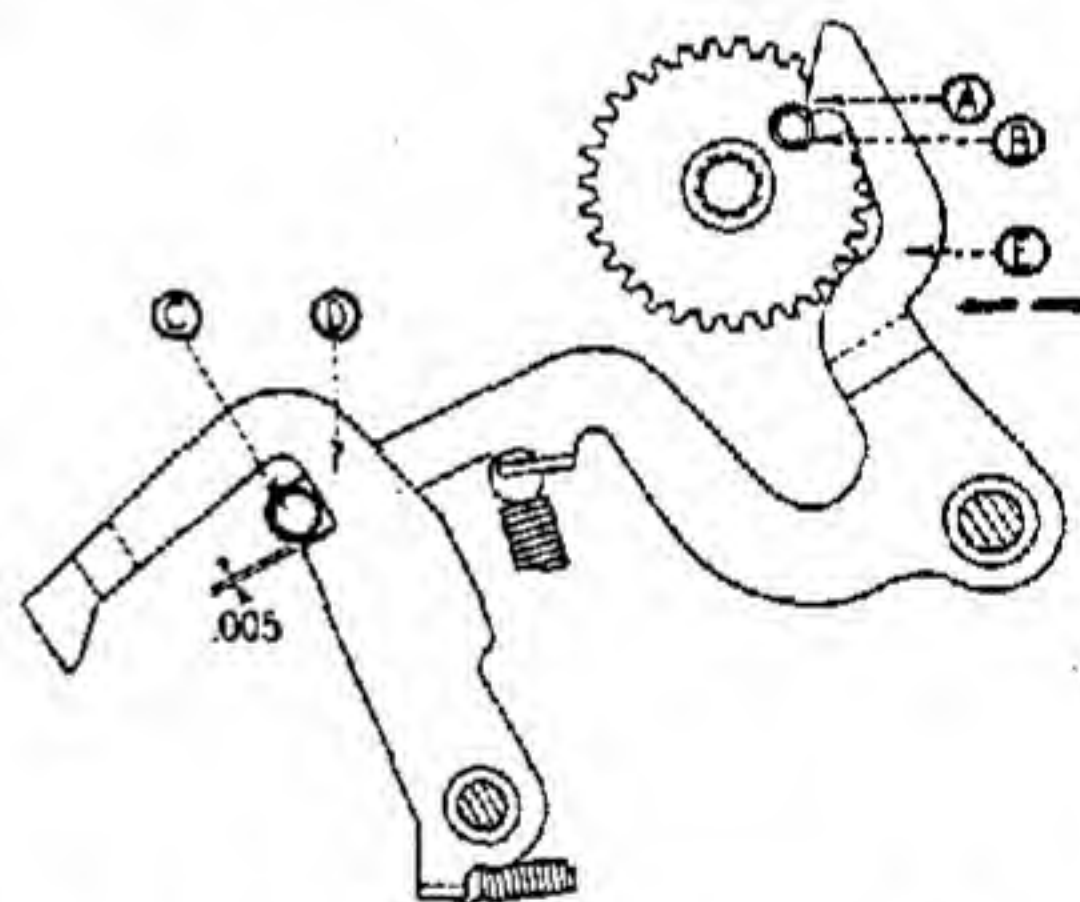
75. DIVISION STOP ON CARRIAGE: Machine in Division and Carriage in first position, Division Stop A should drop behind upper end of Division Latch B when Division Control Arm C is in Add Position. If machine runs over or makes extra revolutions, form Stop A downward to delatch

earlier, or upward if Stop A is not getting behind Latch B.

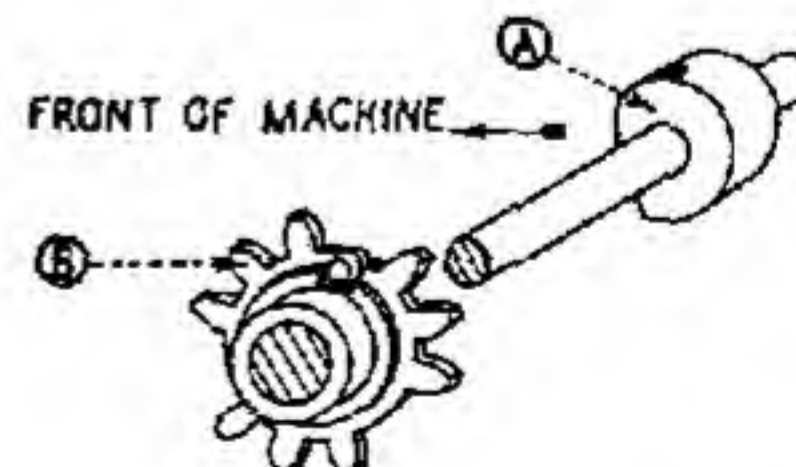


76. BLOCKING ARM (EXTRA TRANSFER IN DIVISION): Fig. 1. Machine in Division, Stud A should have approximately .030 bite on Lever B. Adjust at C, and note slight amount of end play in Shaft D for free action.

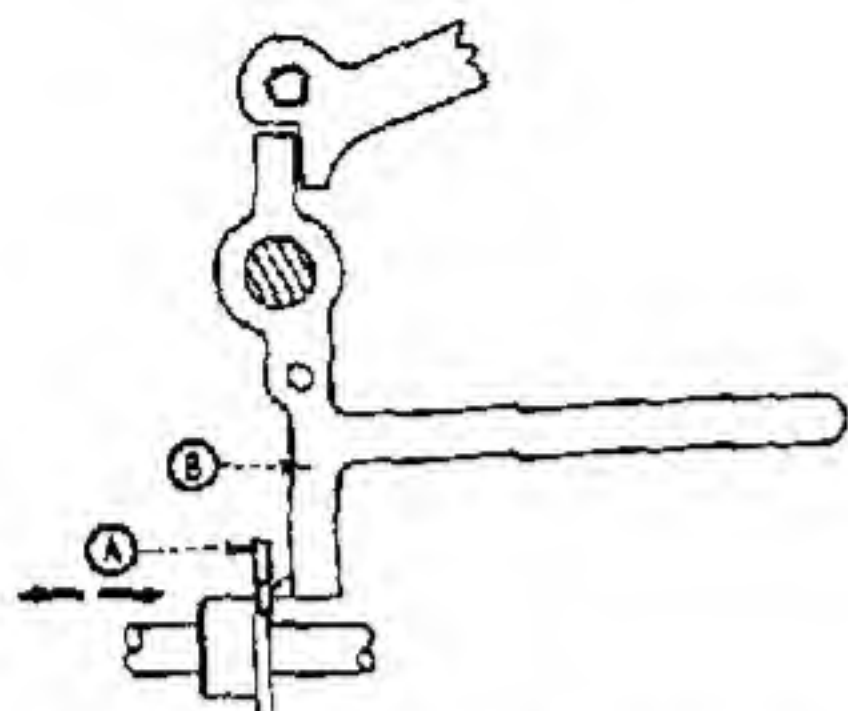
Fig. 2. There should be .010 to .015 clearance between Stud A and Lever B when Cam E is on High Point of Roller F. Adjust by forming at B.



77. DIVISION SETTING LEVER: When Relatch Point of Lever A is on High Point of Roller B, there should be approximately .005 overlatch of Roller C on Latch D. Check Roller B for wear or looseness. If not worn or loose, adjust by forming at E.

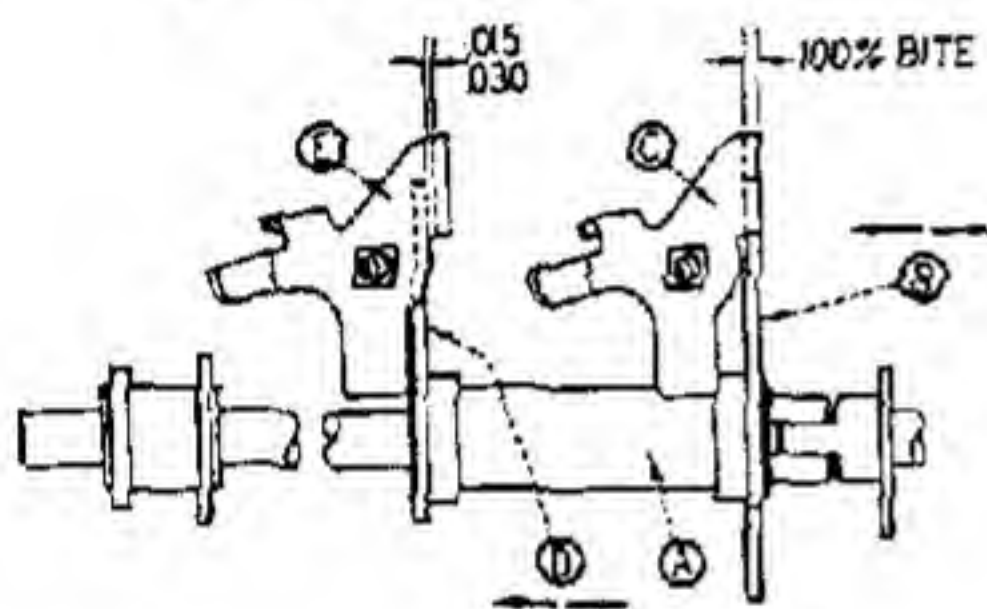


78. DISABLING CAM - SENSING FINGER: When installed, Cam A flat face should be toward front of machine when Division Control Gear B is in Home Position.

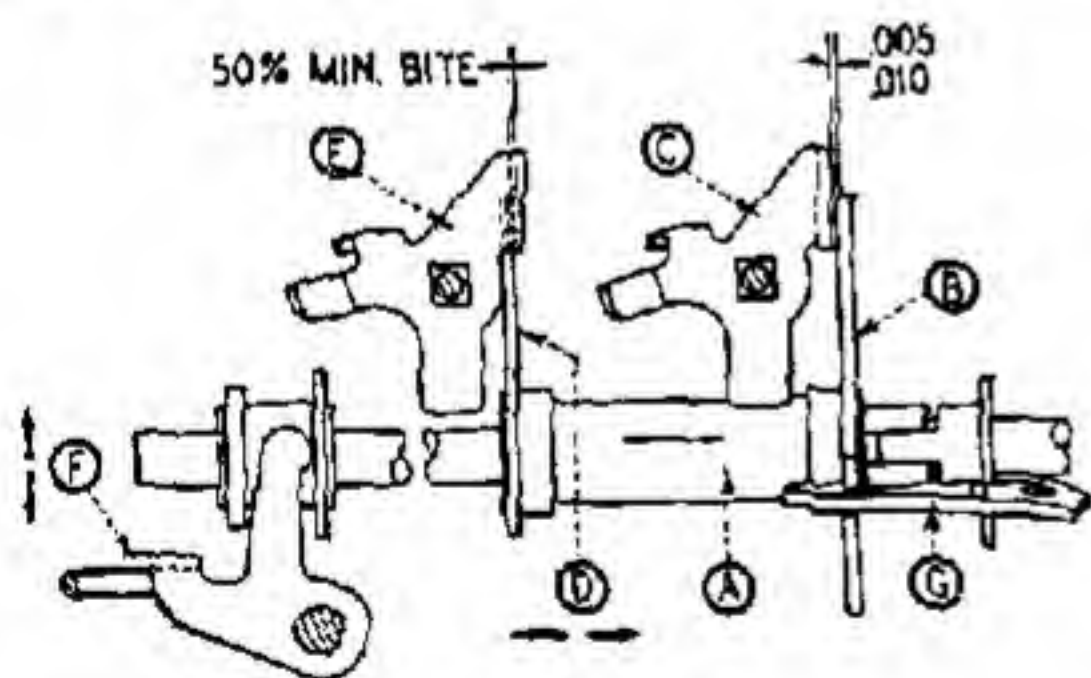


79. SHIFT CENTRALIZER LATCH BLOCKOUT LEVER: Machine in Division, Lever A should positively disable Latch B. Adjust by forming A.

b. DIVISION ALIGNER

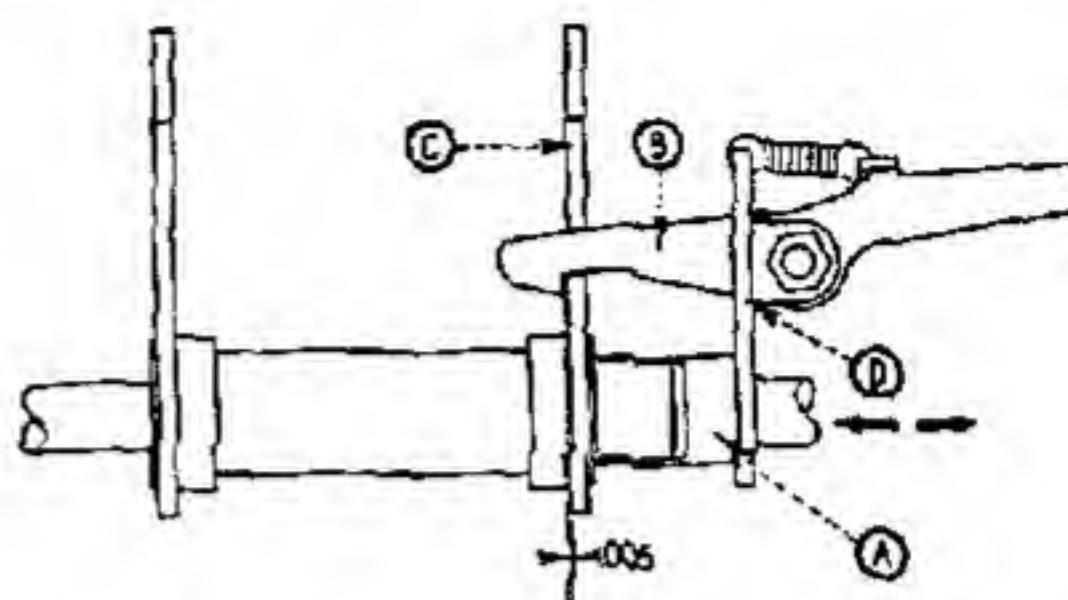


80. DIVISION SHIFT ACTUATOR UNIT: There are two principal adjustments of which this is the first. Unit A in Home Position, Left Shift Arm B should have 100% bite on Left Shift Controller C. Right Shift Arm D clearing Right Shift Controller, E .015 to .030. Adjust by forming Arms B and D.

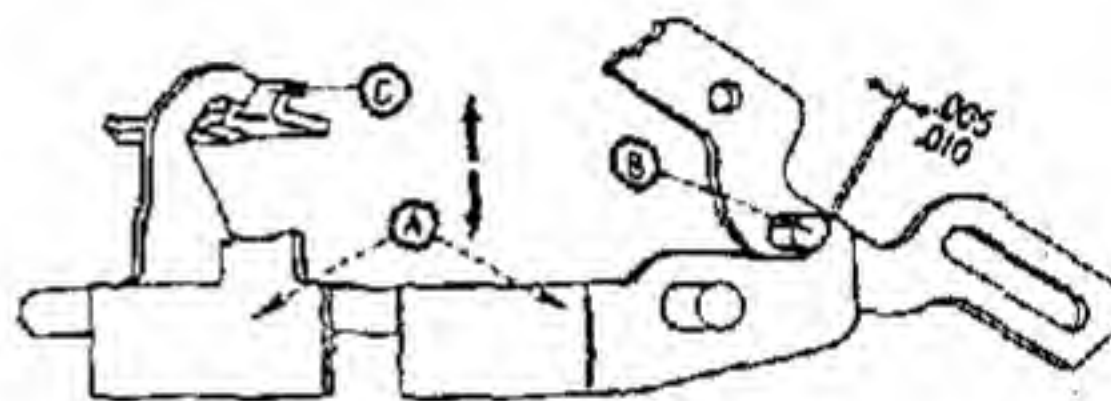


81. DIVISION SHIFT - SECOND ADJUSTMENT: Machine in Division, Upper Dials clear, number in Main Key Board, using handcrank, turn Drive Shaft three complete revolutions. This places Unit A on the Upper or Division Shift Control Latch G only and is as far to the right as Unit A will go while the Carriage is aligning for Division. In this position, Shift Arm B should have .005 to .010 clearance to Shift Controller C and Shift Arm D should have 50% minimum bite on Shift Controller E. Adjust by forming at F. To get

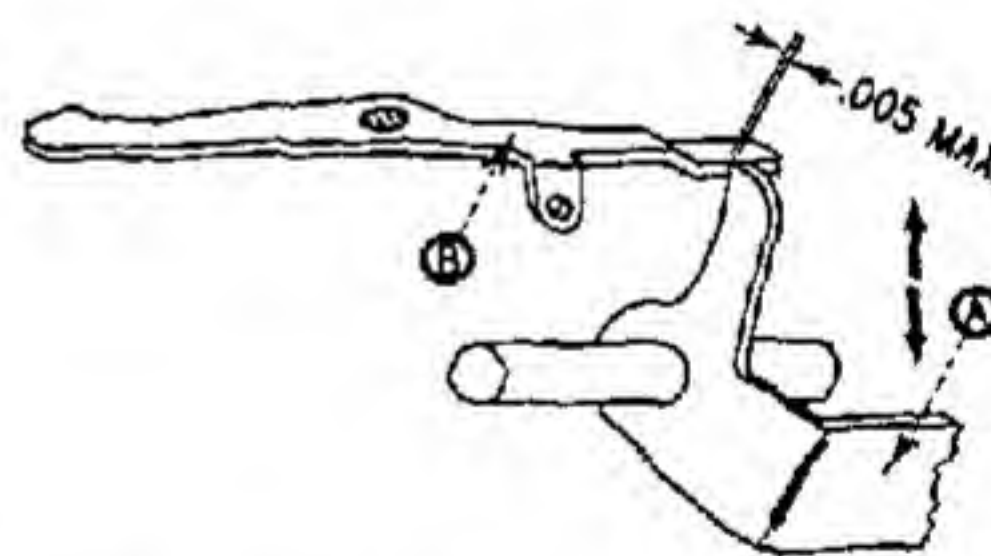
clearance between B and C and form Arm D for proper bite.



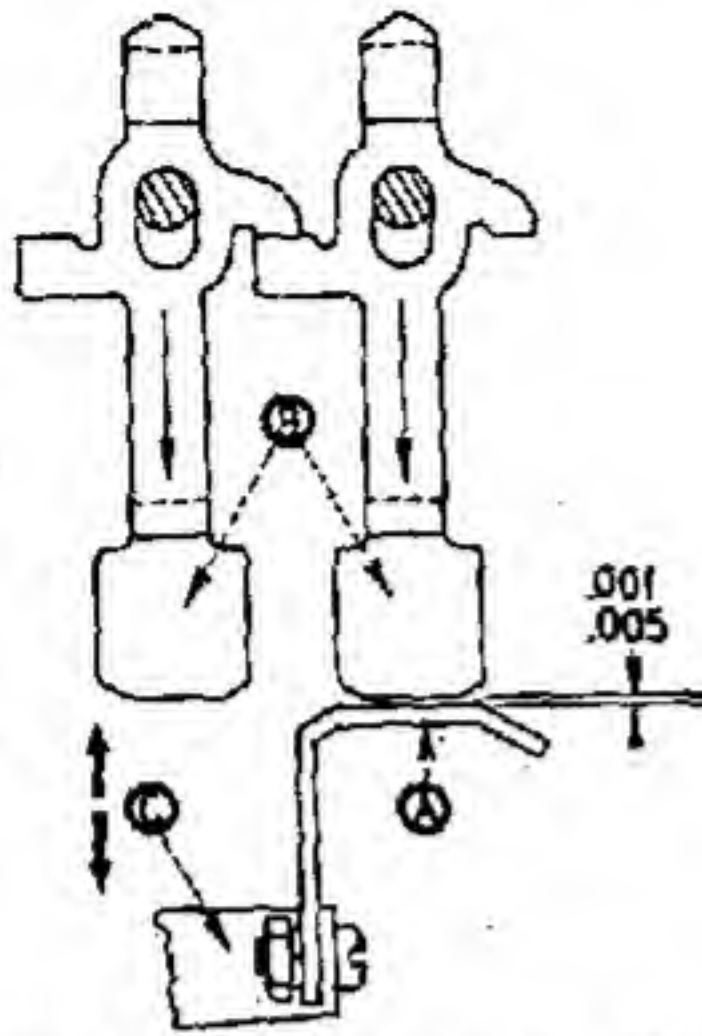
82. LATCHES FOR DIVISION SENSING MECHANISM: When Unit A restores at the end of a Division operation, the shortest Latch B should have approximately .005 overlatch on Left Shift Arm, C. Adjust by forming Bracket at D.



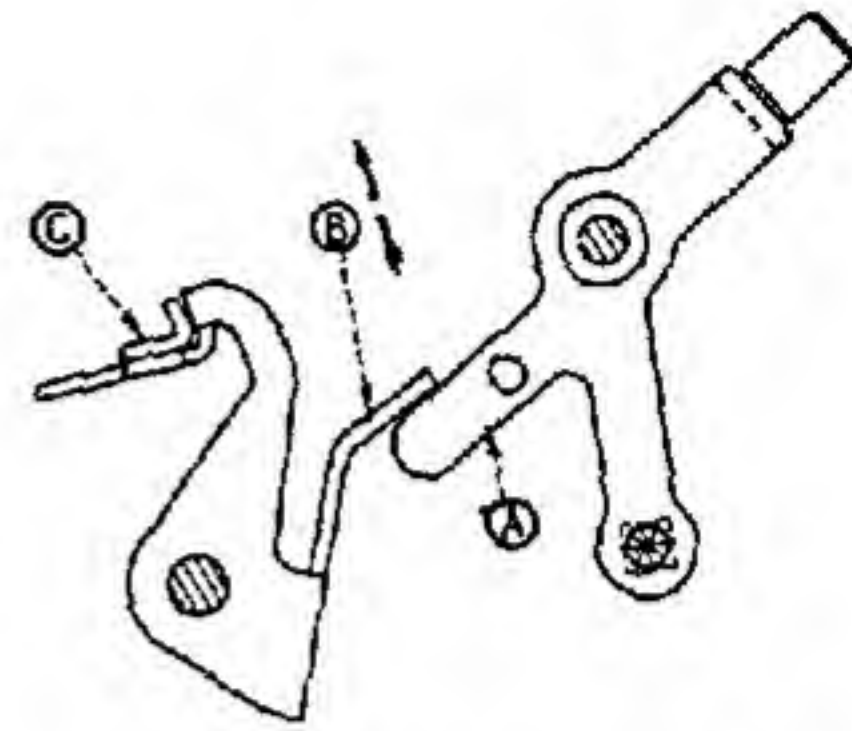
83. SHIFT REVERSING BAIL - DIVISION: Machine in Division, Bail A should have .005 to .010 play between Stud B on Connector Arm and tail of Latch C. Adjust by forming Bail A.



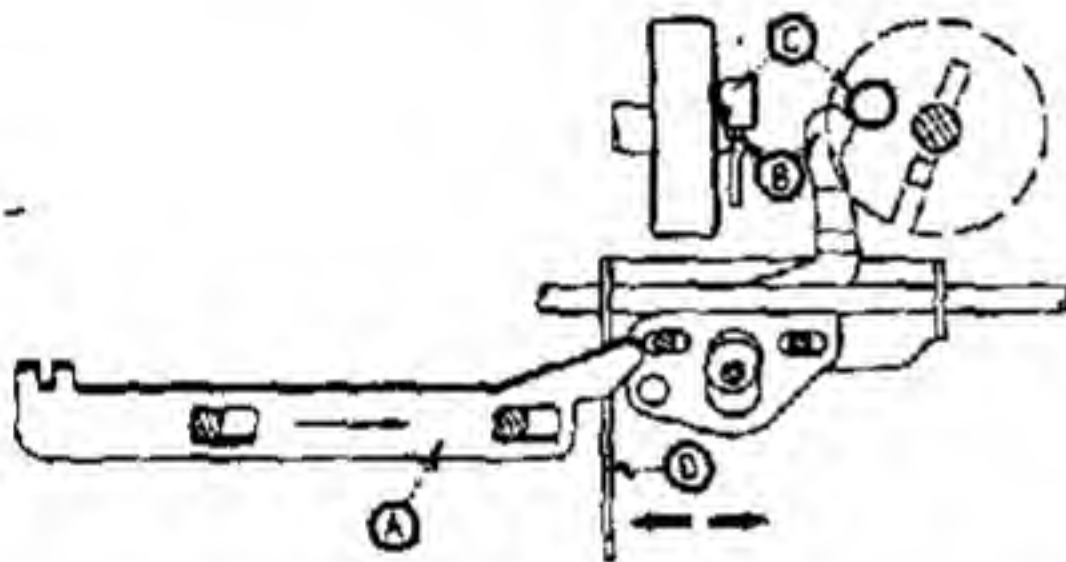
84. SHIFT REVERSING BAIL, SENSING FINGER: Upper Dials clear, put number in last Dial on left, number in left side of Main Key Board. Start machine in Division allow Carriage to Shift to the Right two spaces; then with machine in Division Shift Position, Bail A should have no more than .005 clearance to tail of Latch B. Touching is acceptable if it does not move Latch B. Adjust by forming Bail A.



85. SENSING FINGERS ACTUATING LEVER: Machine in Normal Position and Sensing Fingers B pulled down, there should be no more than .005 clearance between Lever A and Sensing Fingers B. Adjust by forming Lever C, and keep Lever A parallel to ends of Sensing Fingers B.



87. DIVISION SHIFT REVERSING LEVER, LAST POSITION: If Carriage is allowed to reach the last position in a Division Aligner operation, the Shift Gear will make an override action. This actuates Lever A and Bail B to delatch Latch C. Adjust by forming Lip of Bail at B.



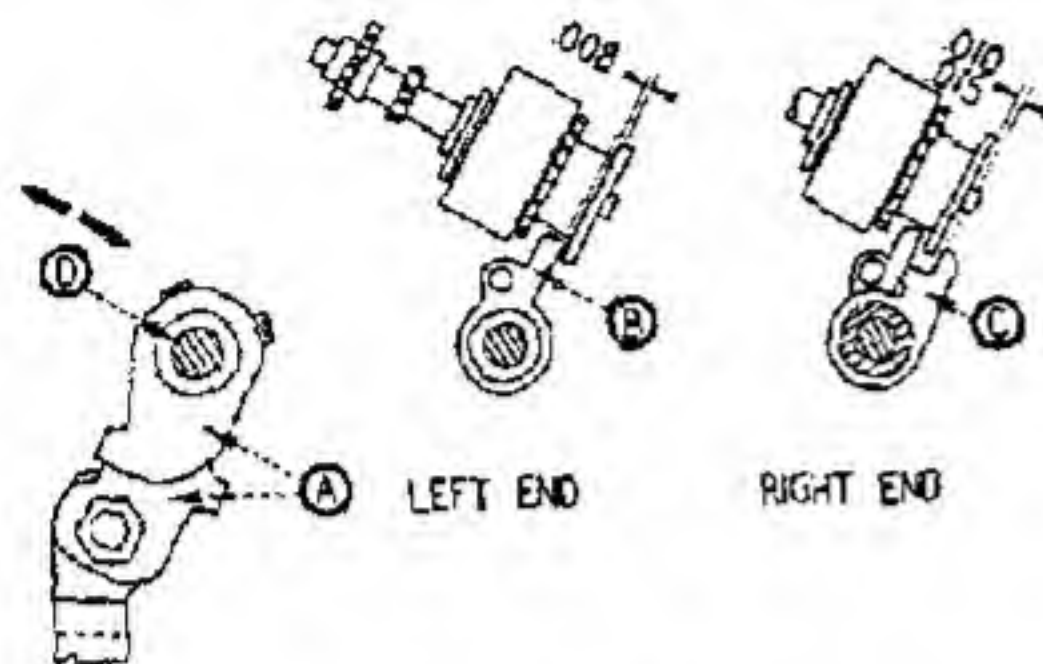
86. CONTROL SLIDE FOR DIVISION THROWOUT ACTUATOR: When Divide Keys are first depressed, Slide A moves to the left to place Division Throwout Actuator B in position to contact Roller C on #6 Actuator. Adjust tail of D.

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anything compared to the DIVIDENDS it PAYS

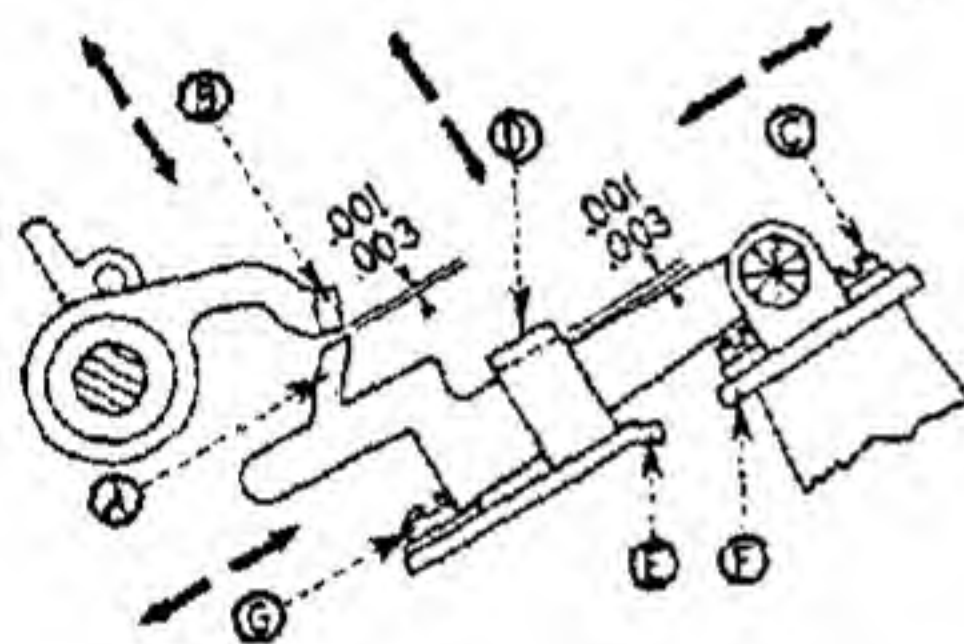
FRIDEN CALCULATING MACHINE CO., INC. CHAPTER 5. COUNTER ADJUSTMENTS

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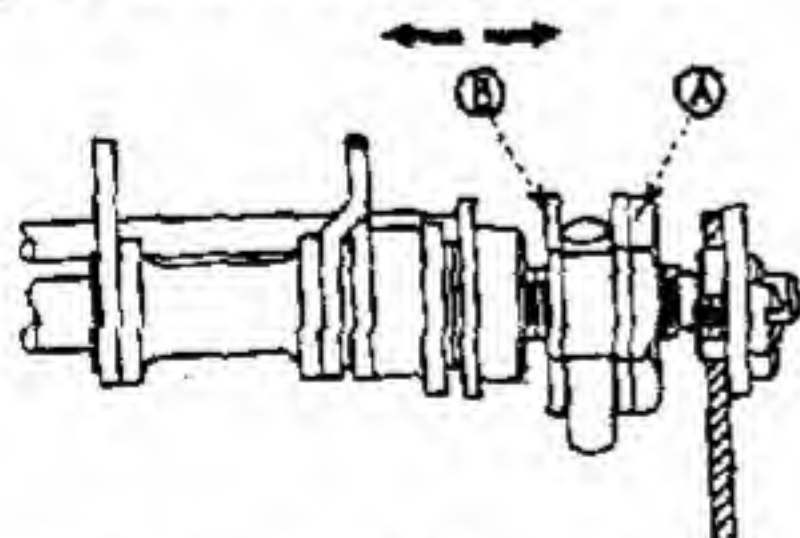
If Counter Dials falter or fail to count or transfer, this will indicate which direction the Counter should be moved. To adjust, loosen Lock Nut A and turn Collar B to right or left, as necessary.



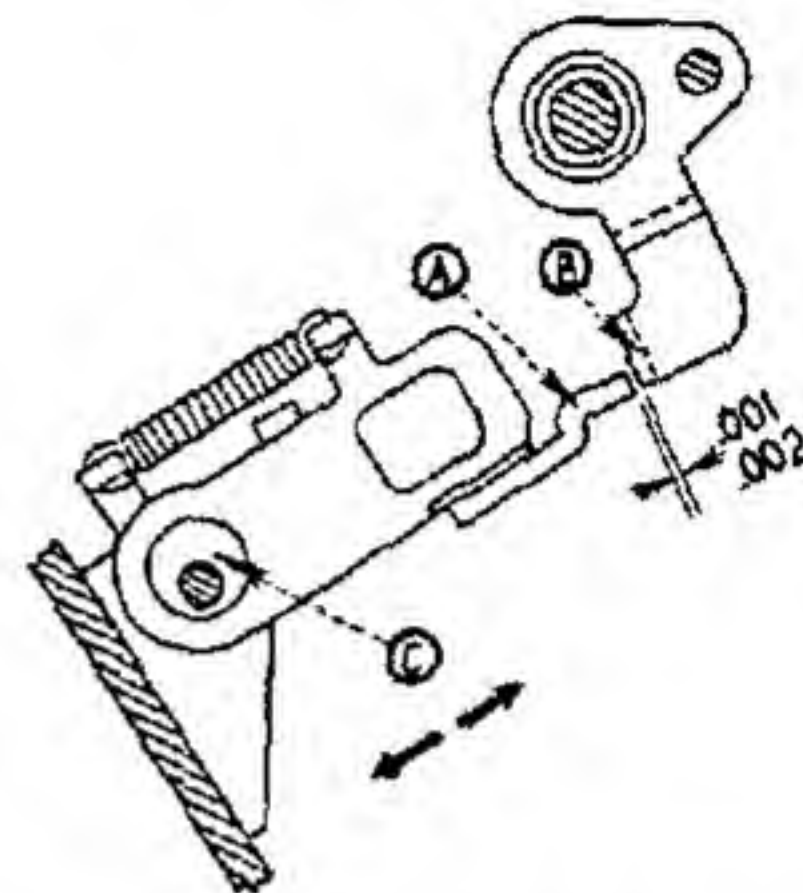
88. COUNTER ROCKER LEVER: Machine in Home Position, Rocker Lever A should hold Counter Fingers so Primary Finger B at left end of Counter clears Counter Blockout Cam .008 minimum as shown. Secondary Finger C on right end of Counter clears Cam .010 to .015 as shown. Adjust at Lever A. Shaft D should be flush with end of A.



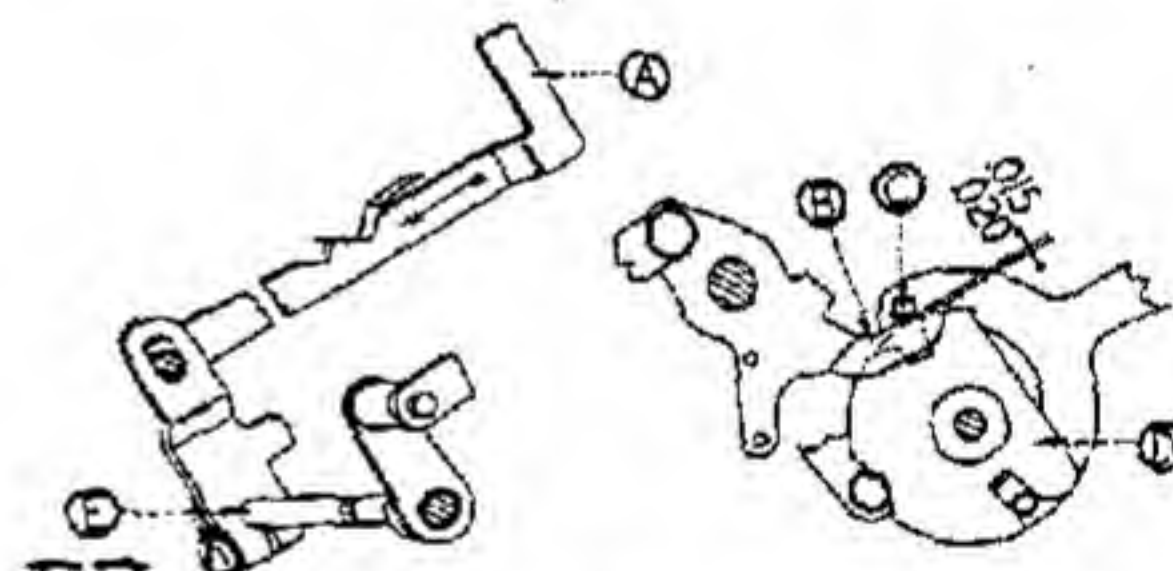
89. COUNTER BLOCKING SLIDE: Point of Slide A should be centered under Blocking Lip B and have no more than .003 clearance, with Add-Subtract Gate centralized. Adjust Slide at C. Form Lip B for clearance. Clamp D should have no more than .003 clearance to Slide A. Adjust by forming. Gate Stop E should contact Gate F when Minus Key is bottomed; adjust at G.



90. COUNTER OSCILLATING COLLAR: Counter should have equal and full throw in both Add and Subtract operations. To test, use "Push-Pull" test as follows: applying no more than one pound pressure, push left end of Counter Shaft, depress Minus and Plus Keys in rapid succession, and transfer 9's in and out of Counter; do the same while pulling on left end of Counter.



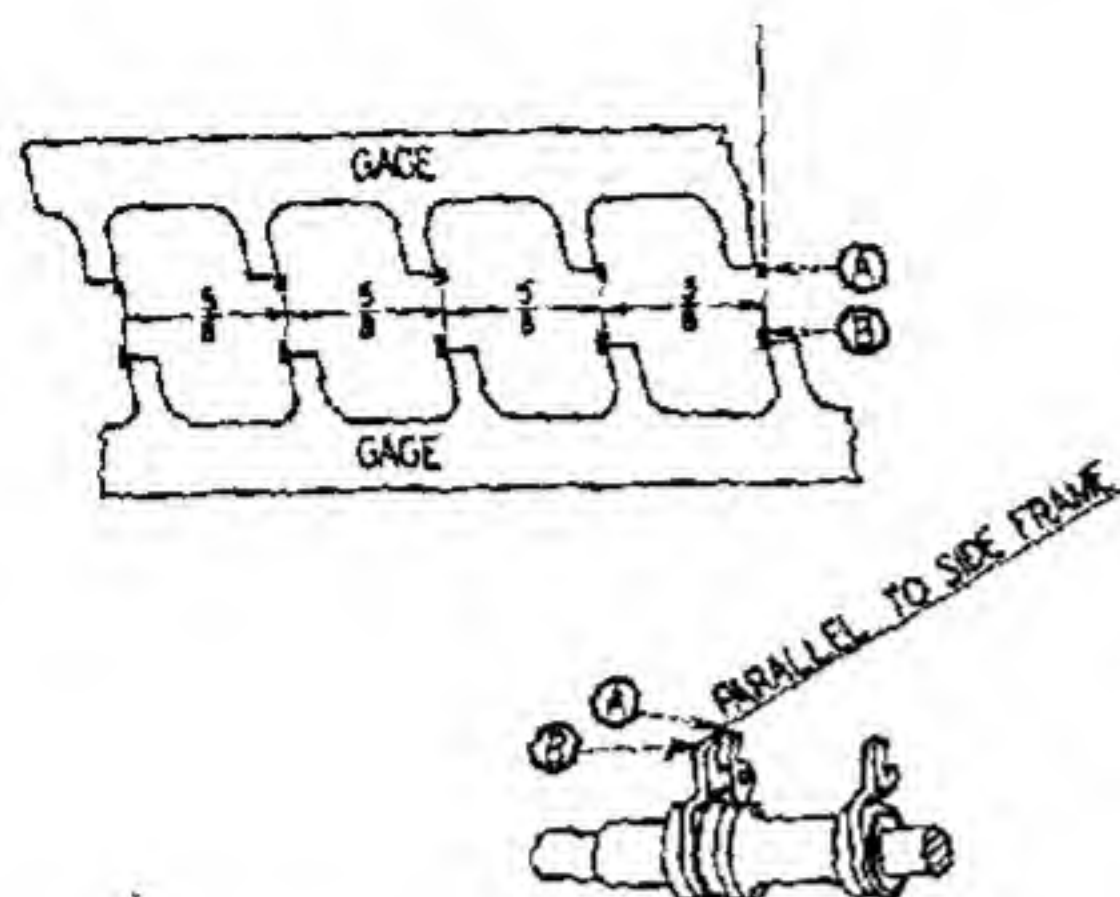
91. COUNTER BLOCKOUT BLOCKING LEVER: Counter in Normal Position and Blocking Lever in Blockout Position; Lever A should clear Lever B on Counter .001 to .002. Adjust by Eccentric C.



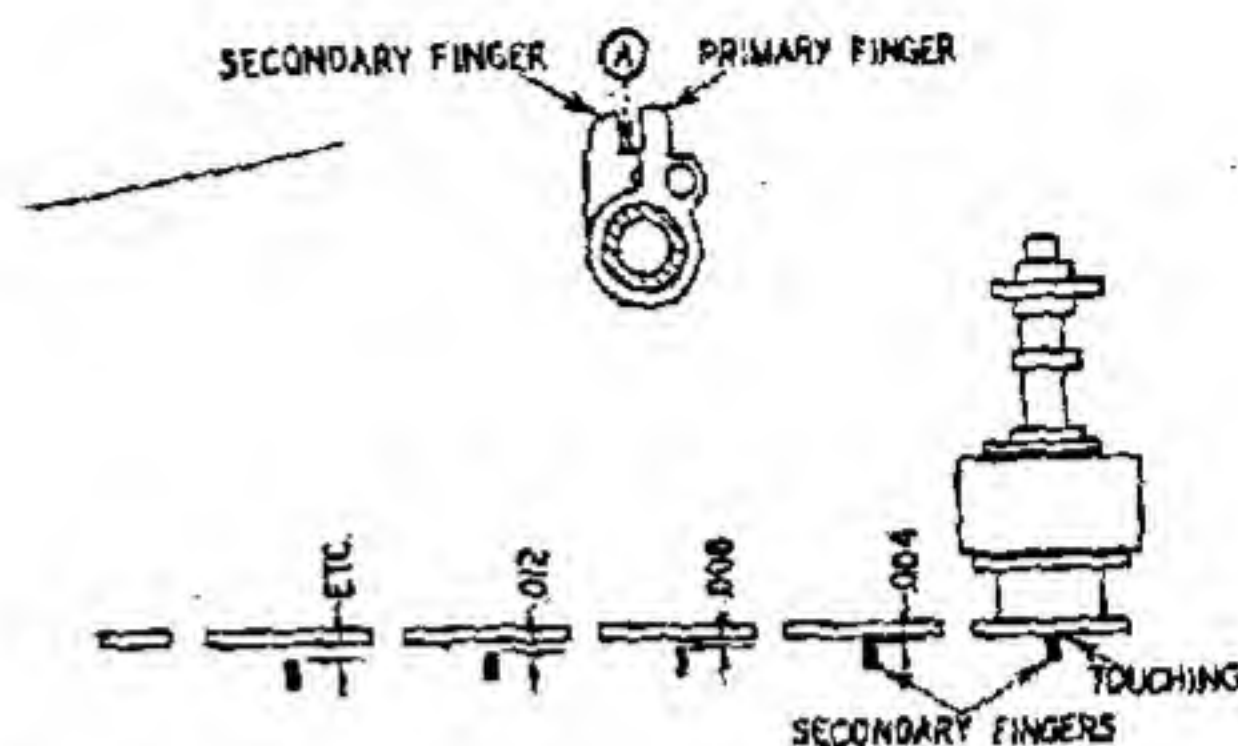
92. COUNTER REVERSE LEVER: When Counter Reverse Lever A is pulled down, Lever B should hold Counter Reverse Arm so Stud C clears Disc D .015 to .020, Gate in Add Position. Adjust at E.

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COUNTER ADJUSTMENTS

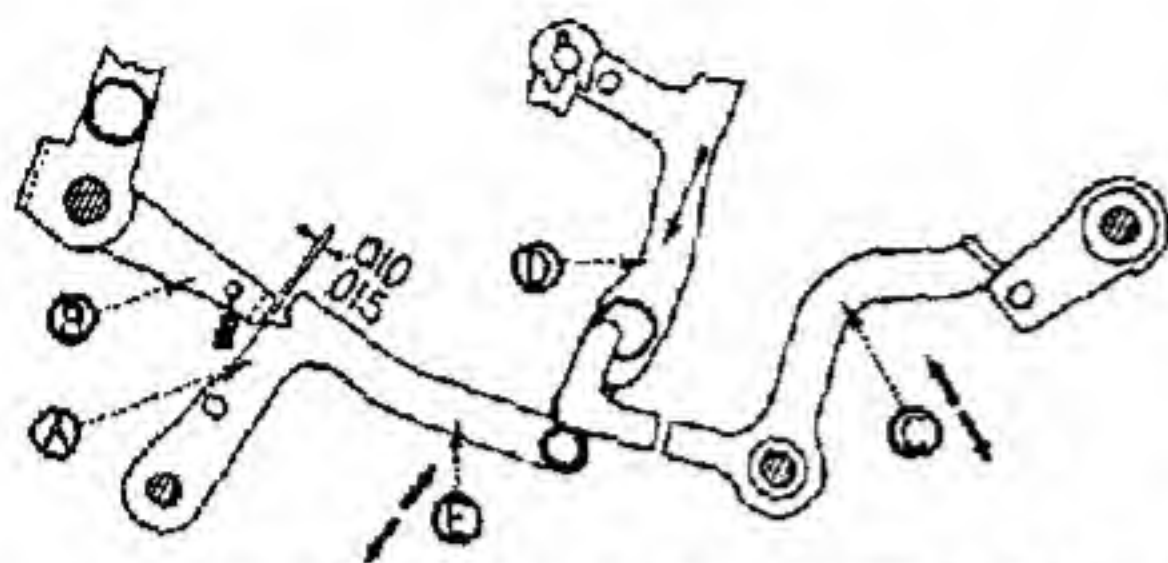


93. COUNTER FINGER ALIGNMENT: Primary Fingers A and Secondary Fingers B should be in line and parallel to Side Frames. The spacing of the Fingers is $5/8$ " between centers. Adjust by forming. A suitable gauge may be made from an Accumulator Zero Stop Slide #90050.

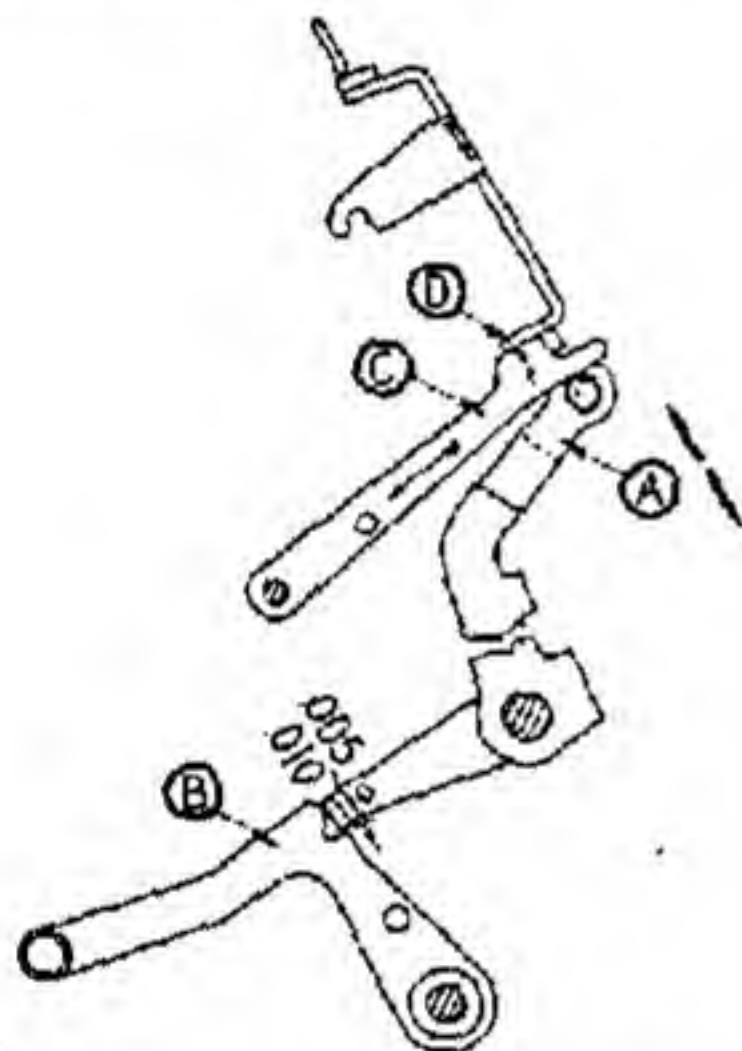


94. COUNTER SPIRAL: No more than one secondary Finger should touch the Secondary Cam on the Counter Dials at any time. Otherwise, there is a possibility of an error due to a false transfer or "Secondary Pick-up." This Spiral is the amount each Secondary Tooth is behind the Tooth to the right, and is very small - only approximately .004 for each Counter Tooth Assembly. The above illustration is slightly exaggerated to show what is meant by Spiral in the Counter. When a Pick-up or Flicker is noted in Counter Dial to the left of the Transfer Point, correct by peening the Lug on the Secondary at A and in the position where the error occurs. PEEN VERY LIGHTLY.

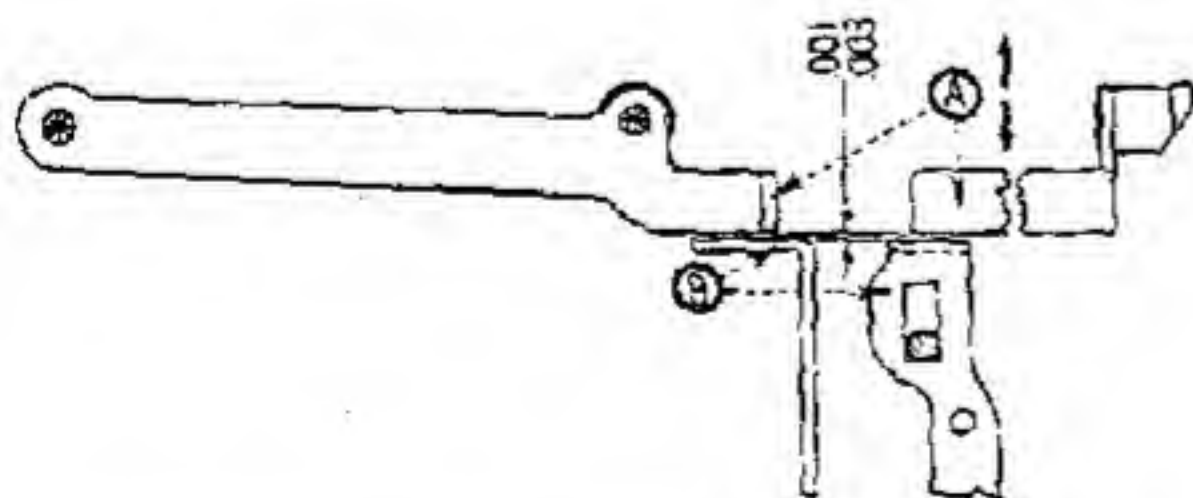
FRIDEN SERVICE doesn't COST the customer anything compared to the DIVIDENDS it PAYS



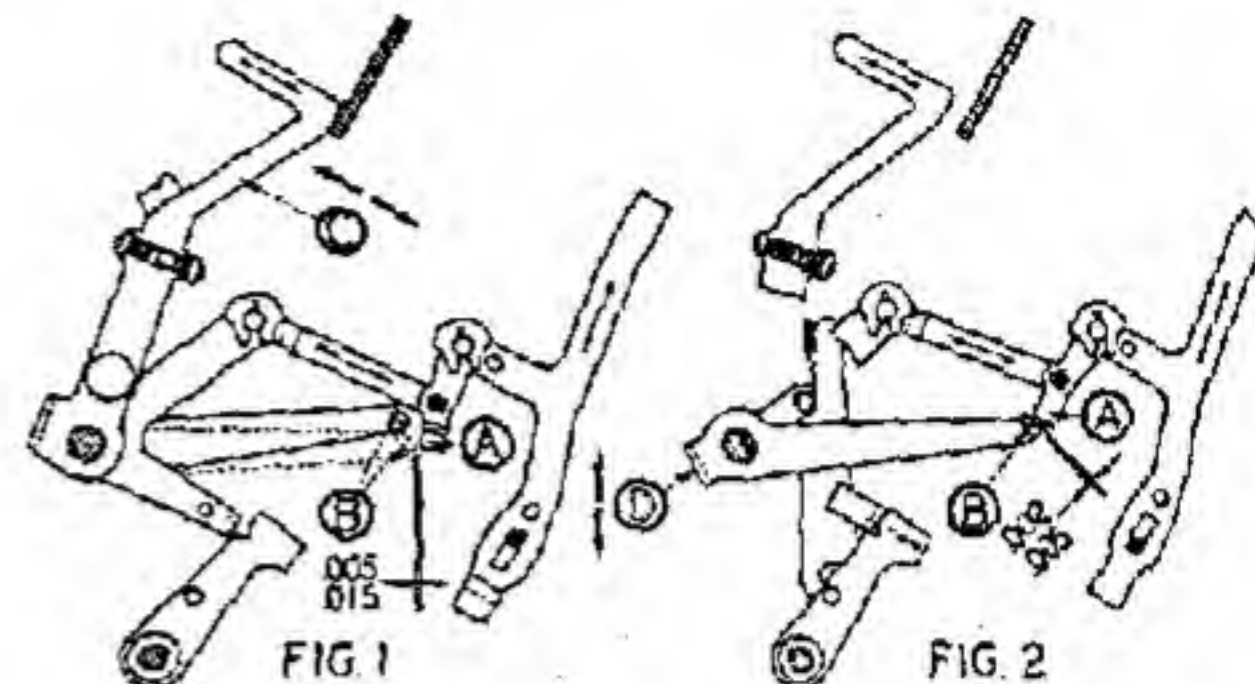
95. DIVIDEND TABULATOR SHIFT SET-UP LEVER LATCH: In Home Position, Latch A should have .010 to .015 clearance to Shift Set-Up Lever B. To adjust, form Latch Control Lever C. In Dividend Tabulation Operation, Slide D should positively delatch Latch A and have approximately the same clearance as shown above. Adjust at E by forming.



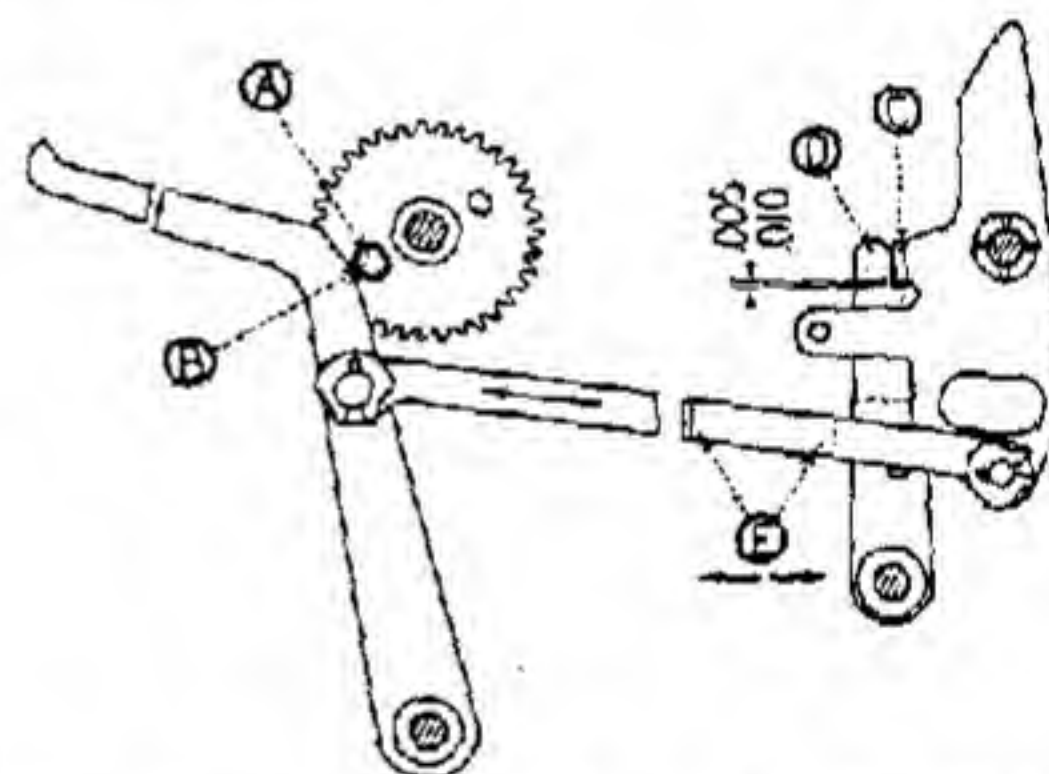
96. TABULATOR SHIFT ACTUATING LEVER: When Carriage Shift Gear is on High Point on Override Pawl in Dividend Tabulation, Shift Lever A should have .005 to .010 overlatch on Latch B. Adjust by forming Shift Lever at A. After adjustment, see that Lever C slides freely under Disengaging Slide D.



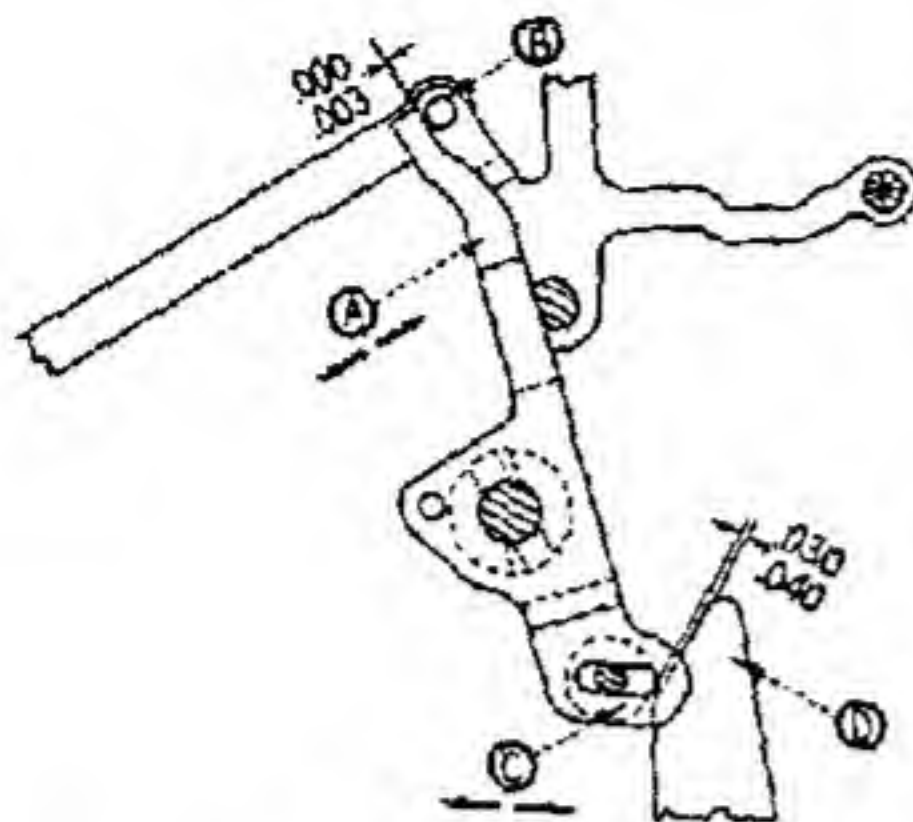
97. TABULATOR ACTUATOR LEVER: In Normal Position, tail of Lever A should rest lightly on top of Slide B with very little play. Adjust by forming tail A.



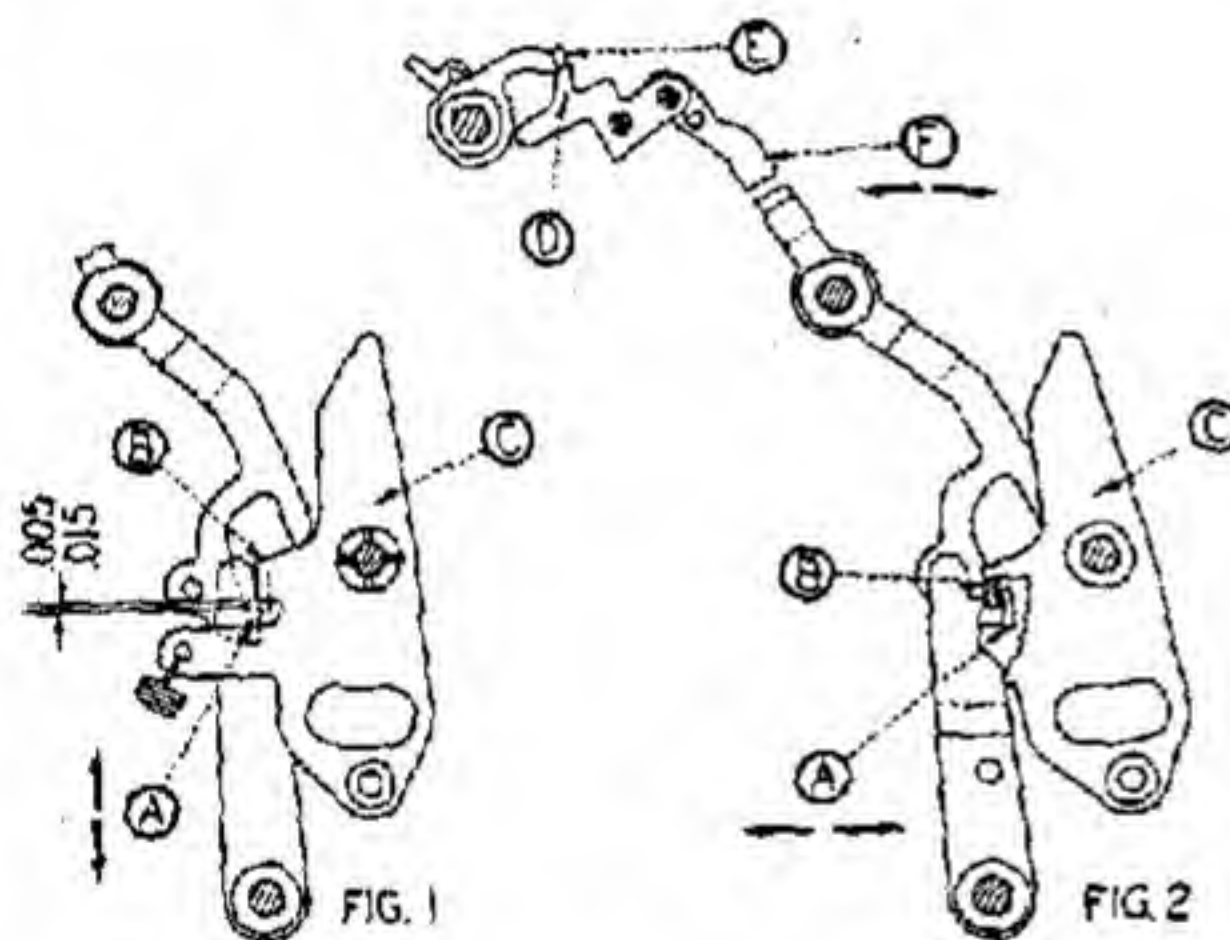
98. ADD-SUBTRACT GATE DELATCH LEVER: Fig. 1. In Normal Position, Trip Lever A should clear end of Delatch Lever B .005 to .015. Adjust by forming Shift Lever at C to allow Trip Lever A to drop back to the desired clearance. Fig. 2. Machine in Dividend Tabulation and Carriage shifting to the right, Trip Lever A should move over lip on Delatch Lever B with no more than .002 to .005 clearance. Adjust by forming Lever B at D.



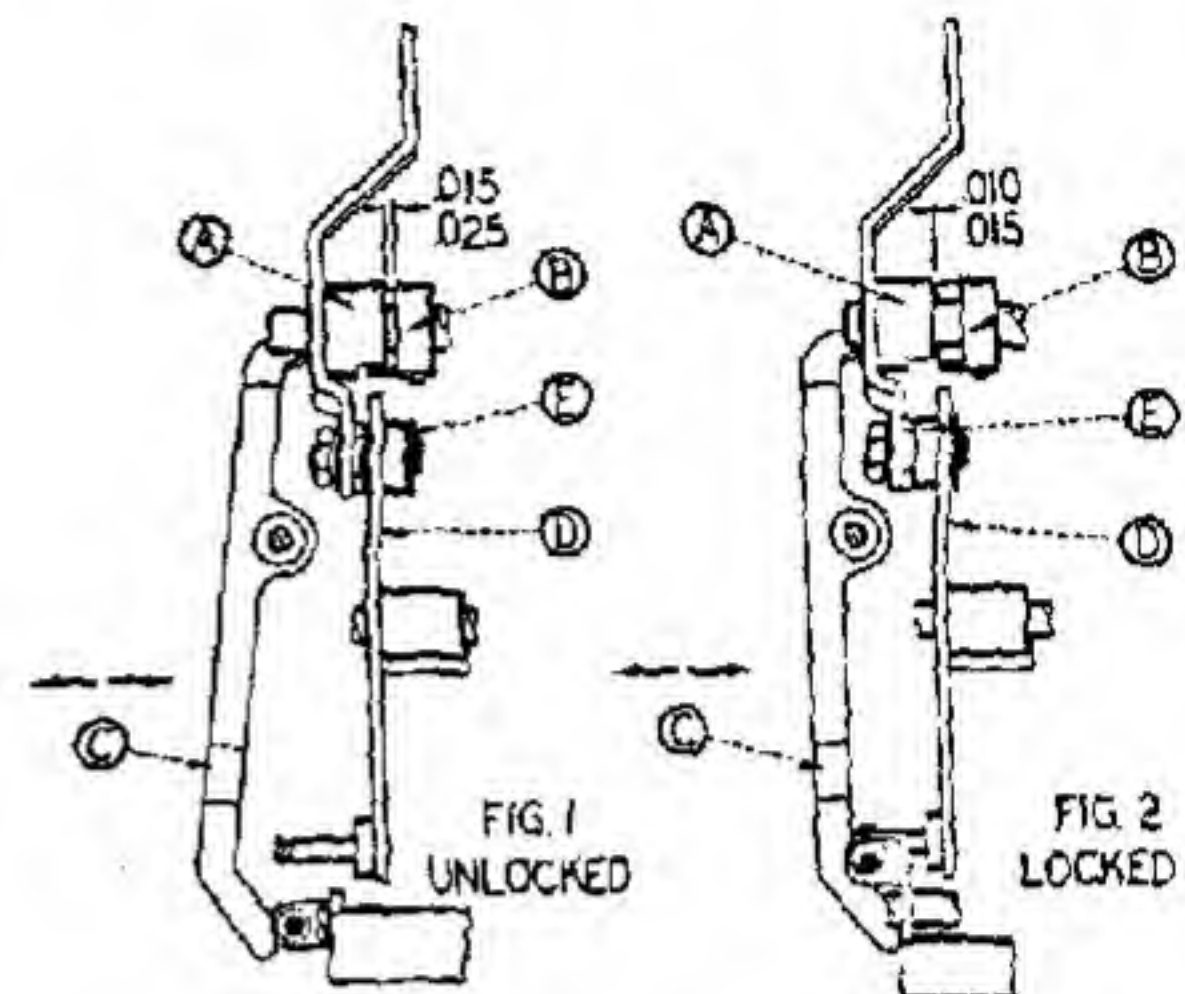
99. ADD-SUBTRACT GATE RELATCH LEVER LINK: When Roller A is on High Point of Lever B. Lever C should have .005 to .010 overlatch on Latch D. Adjust by forming Link E at points indicated by arrows, and be careful to keep Link perfectly free on its Stud.



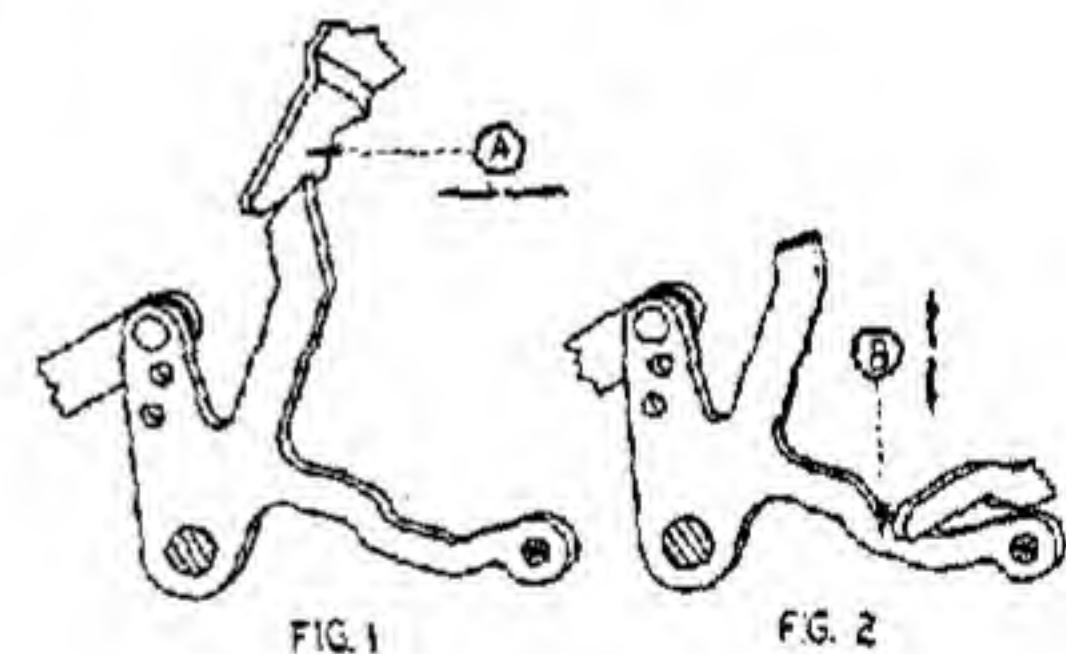
100. ADD - SUBTRACT GATE ACTUATING LEVER: In Home Position, Lever A should rest lightly or have slight clearance to Stud B. Adjust by forming at A. With Minus Key depressed, there should be .030 to .040 clearance between Roller C and Lever D. Adjust Roller C.



101. COUNTER BLOCKING LEVER ACTUATOR LEVER: Fig. 1. When Dividend Tabulator Key 2 is depressed, Lip of Lever A should clear under Latch Lip B .005 to .015. Fig. 2. When Lever C is tripped, Lip B should drop behind Lip A. Adjust by forming Lip A. In this position, Blocking Lever D should be approximately centered under Counter Blocking Lever E. Adjust by forming at F.

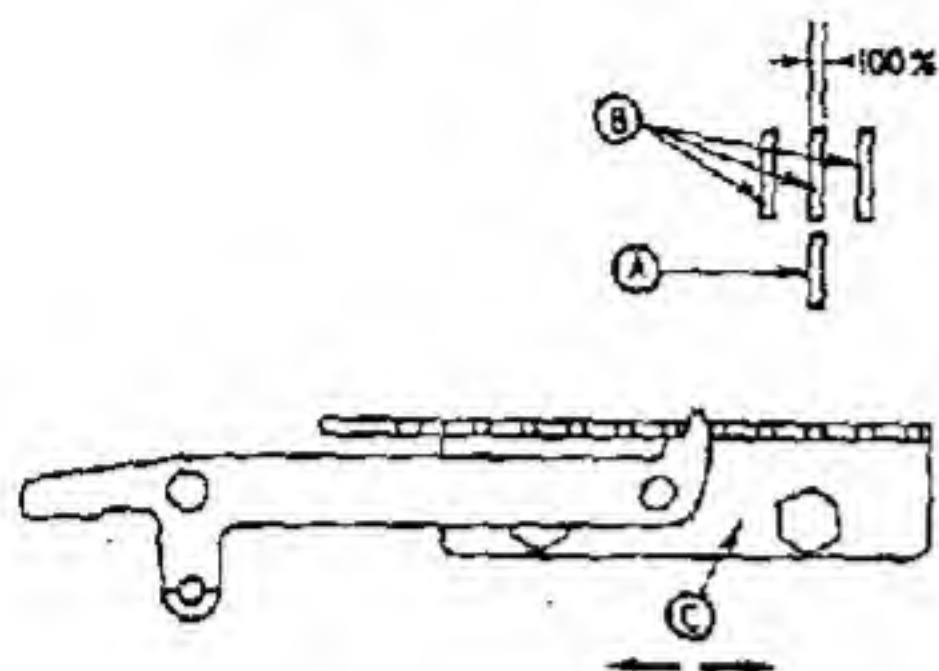


102. PLUS-MINUS GATE CONTROL ACTUATING LEVER: Fig. 1. With Key Board unlocked, Hub A should clear bottom of Hub B .015 to .025. Fig. 2. With Key Board locked, Hub A should clear Spline of Hub B .010 to .015. Adjust by forming Lever C. Lever D should have a full bite on Roller E in both positions.

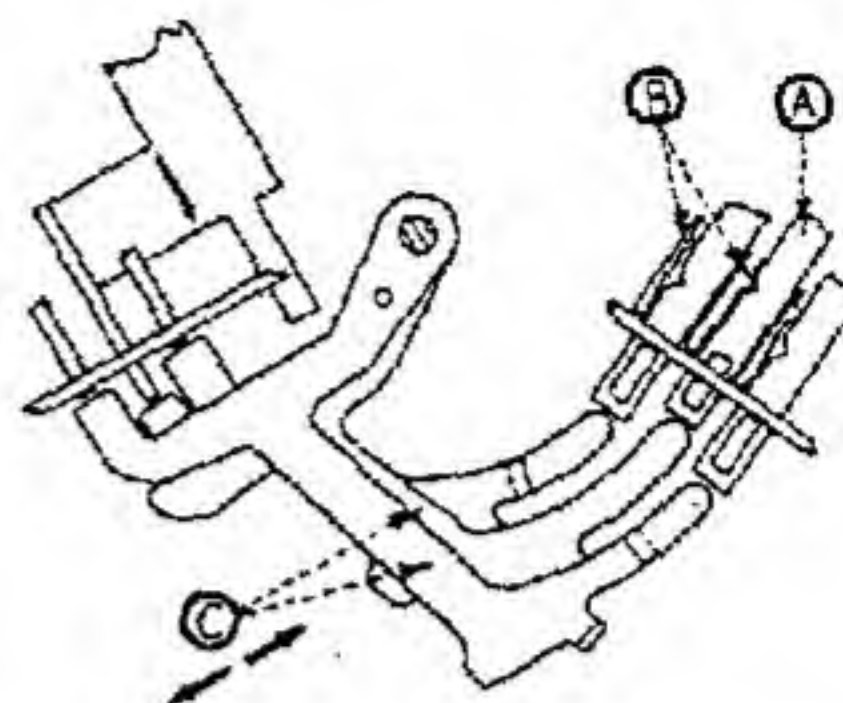


103. TABULATOR KEY RELEASE LEVER: With no Tabulator Stop depressed, Dividend Tabulator Key should release on first override action when Carriage reaches last position. If Key fails to release, adjust tail of Override Pawl A outward (Two Point Shift), Fig. 1. Adjust end of Lever B upward (Four Point and Smooth Shift), Fig. 2.

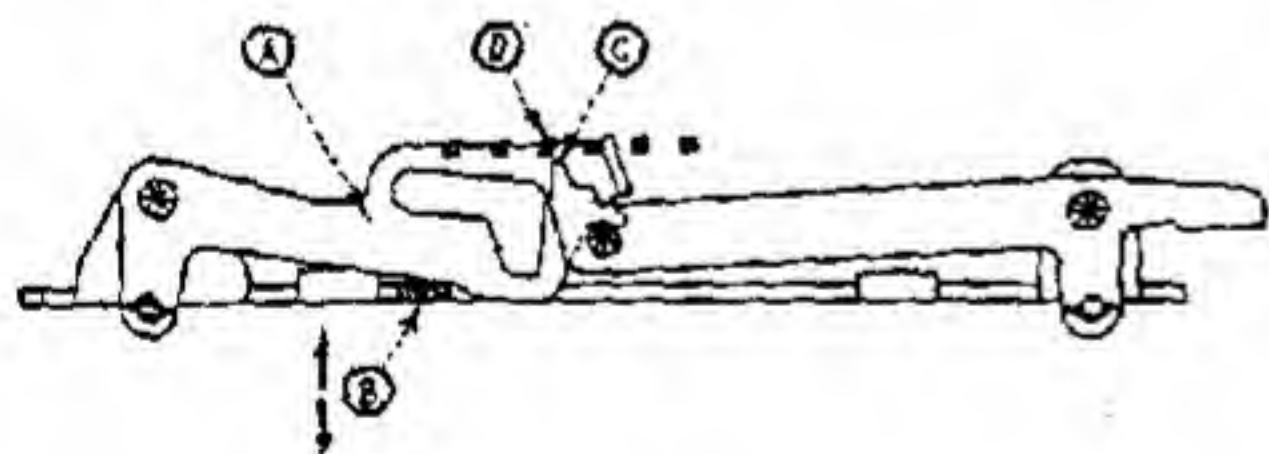
α. SELECTION



104. ESCAPEMENT BRACKET: Setting Levers A should contact Setting Pins B with 100% contact. Adjust Bracket C.



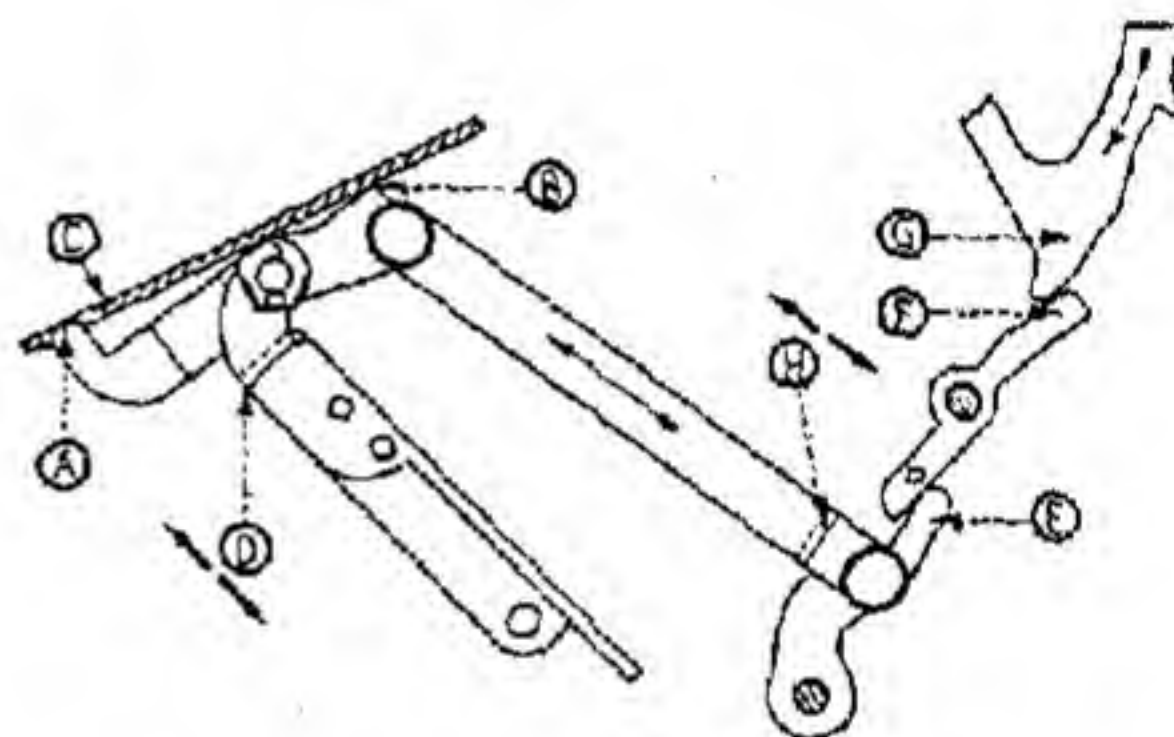
105. BUMPER FOR MULTIPLIER UNIT, LAST POSITION: With Multiplier Unit in last position, Escapement Pawl A should be free to move up and down without contacting tooth in Bracket B. Adjust Bumper C.



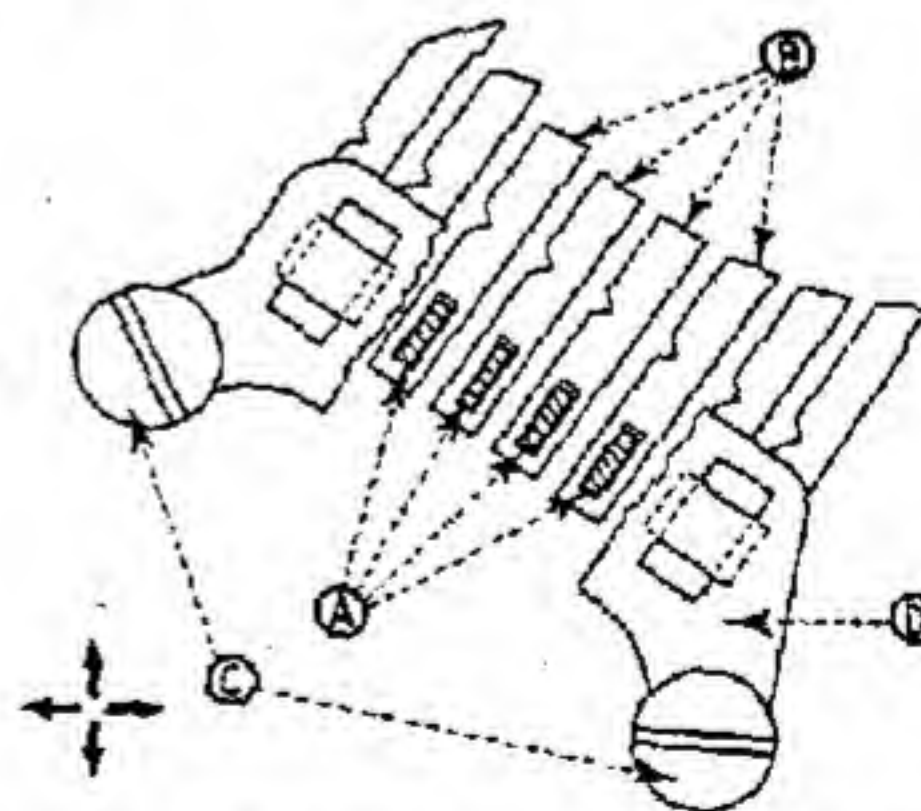
106. ESCAPEMENT PAWL STOP ON BOTTOM PLATE: When Escapement Pawl A is depressed, it should contact Stop Lip B at the moment point of Pawl C clears tooth of Escapement Bracket D. Test by slowly depressing Zero Key; when Unit drops off Pawl C, Pawl A should contact Stop B. Adjust by forming Stop B.

107. MULTIPLIER SETTING LEVERS: When entering numbers in Multiplier Unit, Setting Pins A should snap into place on Detent Springs B just

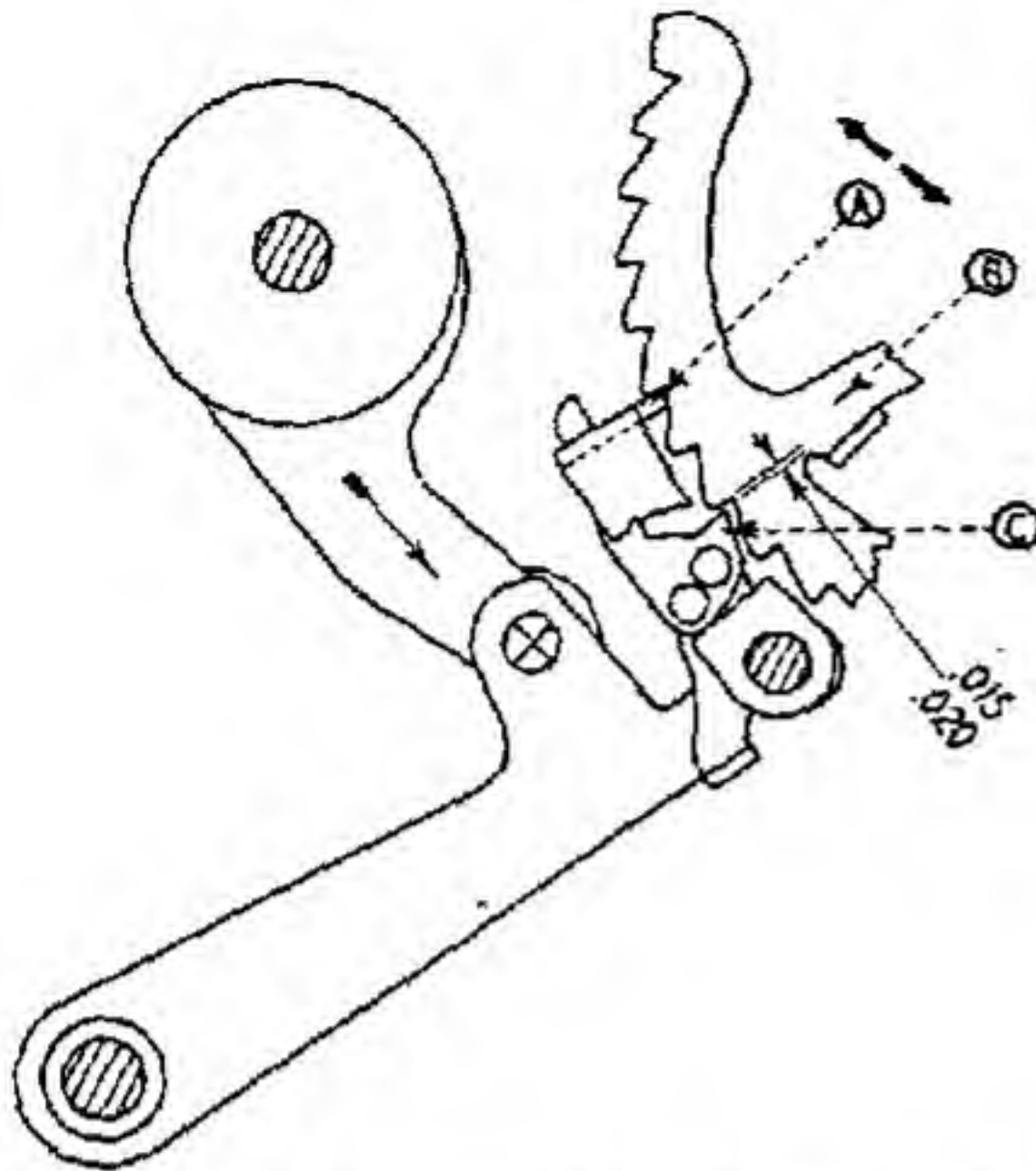
before or as Escapement Pawl releases Unit. Adjust by forming Levers C.



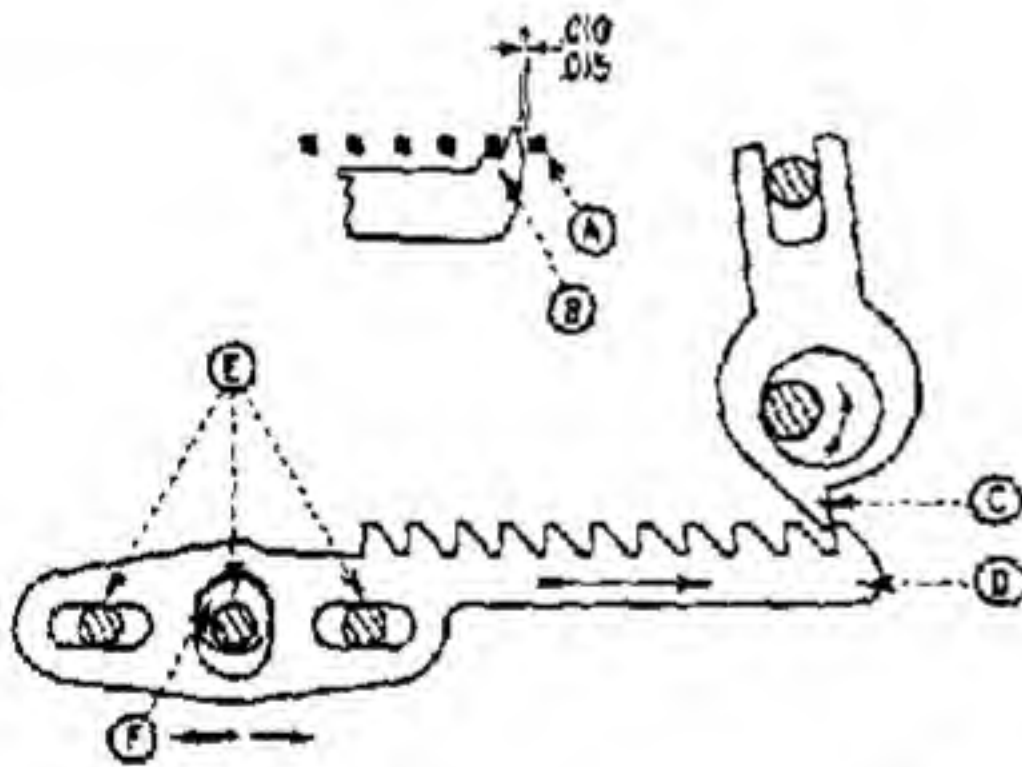
108. SELECTION SEGMENT RELEASE LINK: When a Selecting Key is depressed, point of Lever A should limit at point B when flush with top of Bottom Plate C. To adjust, form Bracket D. Lower Lever E should trip Latch F and release Segment G immediately before the escapement of the Unit takes place. Adjust by forming Link at offset H.



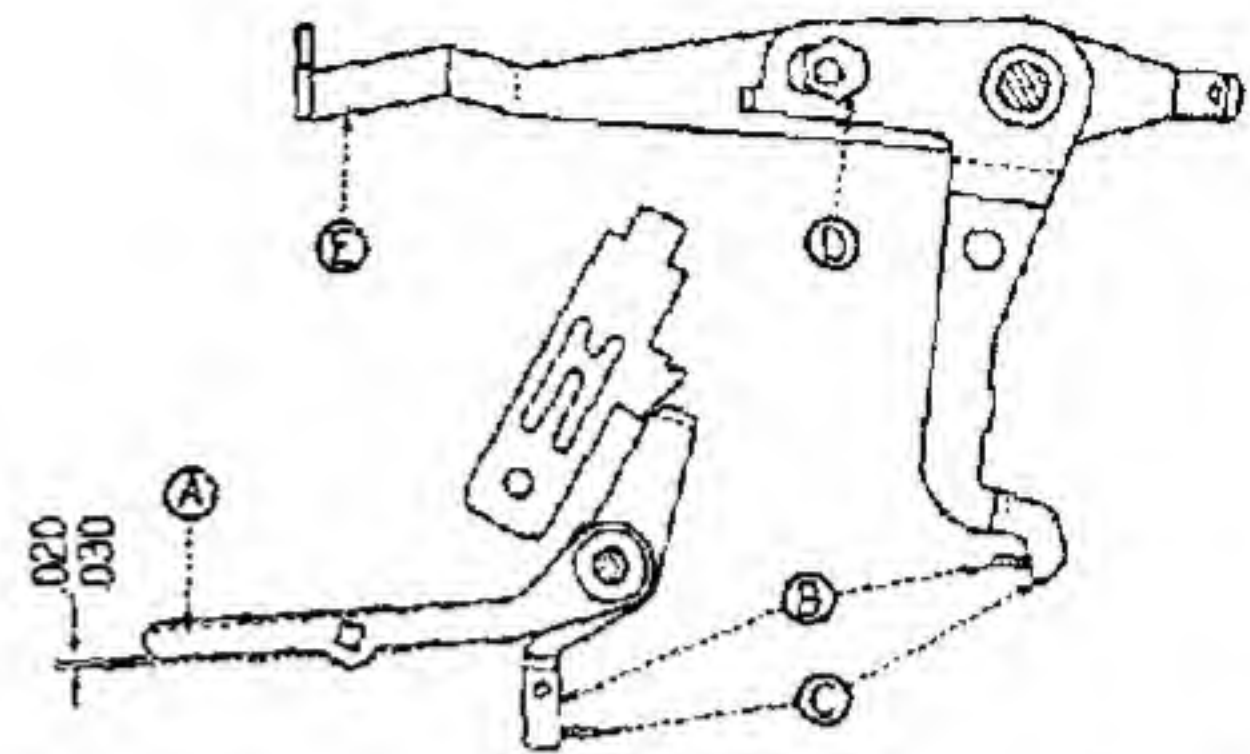
109. RESTORE FINGERS: Restore Fingers A should go through slots in Setting Pins B with little or no friction. To adjust, slightly loosen two screws C and lightly tap Assembly D into position of least friction. It is sometimes necessary to align some of the individual Fingers A by forming.



110. MULTIPLIER SEGMENT HOLDING PAWL: When Segment is feeding out, Pawl A should hold Segment B so when Feed Pawl C is at low point of travel, there will be .015 to .020 overlatch below tooth on Segment B. Adjust by forming Holding Pawl at A.

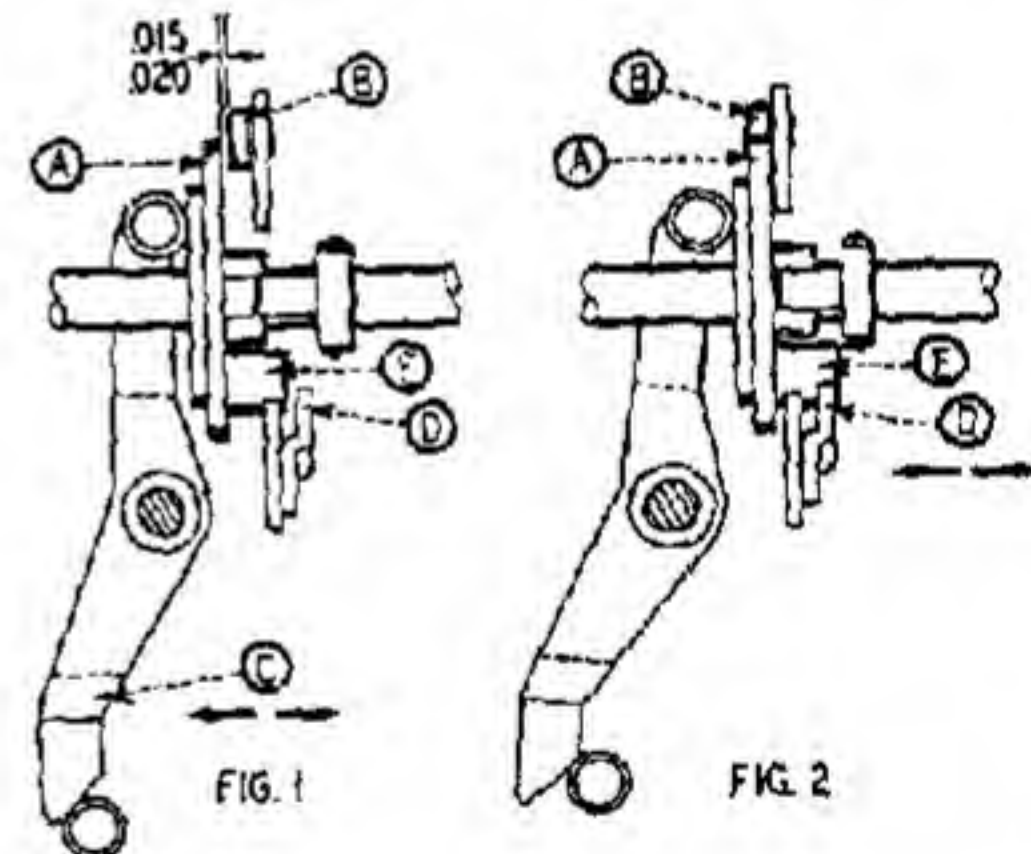


111. MULTIPLIER UNIT SHIFT RACK: With Multiplier Unit Shifting, there should be .010 to .015 overthrow of Escapement Bracket A on Pawl B when Shift Pawl C is at point of greatest throw on Shift Rack D. To adjust, loosen three screws E and adjust Eccentric F.



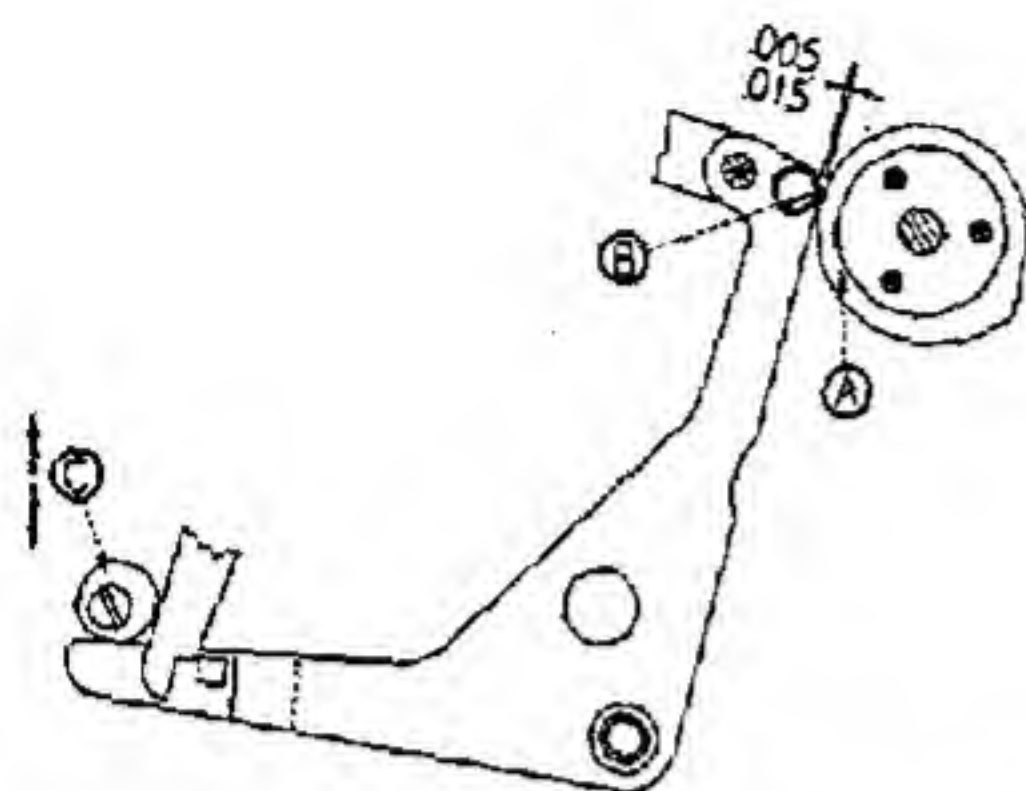
112. MULTIPLIER KEYS RELEASE BAR: When first number is entered in Multiplier Key Board, Lever A should drop .020 to .030 at end. This is to ensure proper restoring of Multiplier Mechanism at end of operation. Note that in Home Position Levers B and C contact with some pressure. Adjust by Eccentric D. NEVER BEND ARM E.

B. POWER SET ADJUSTMENTS

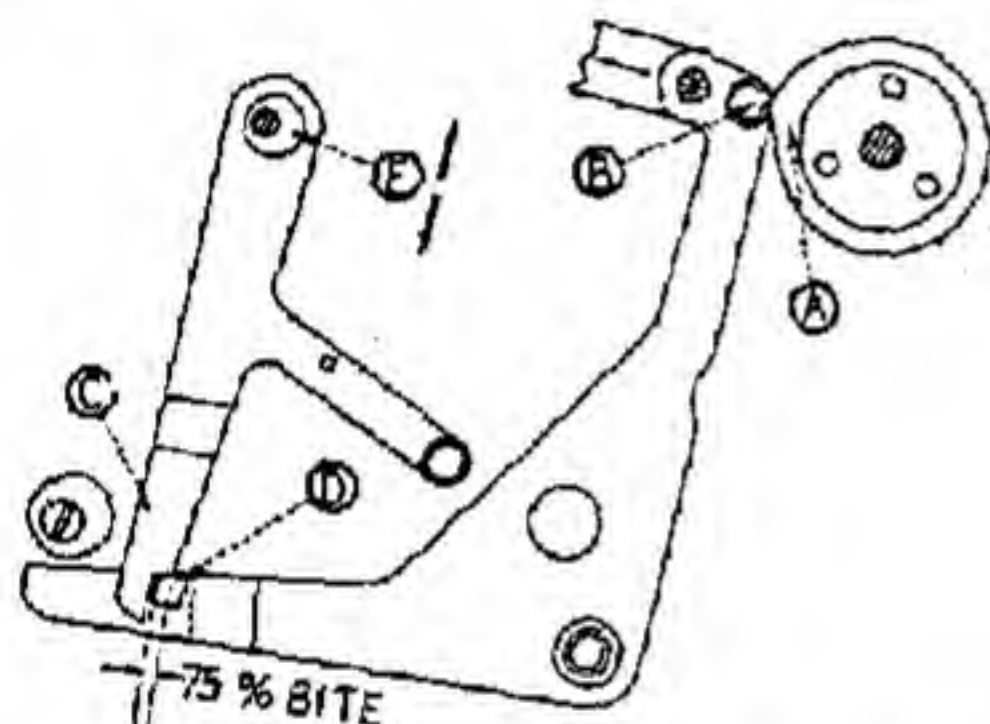


113. POWER SET CAM THROWOUT LEVER: Fig. 1. Machine in Home Position: there should be .015 to .020 clearance between Power Set Cam A and Roller B. Fig. 2. Machine in Multiplication operation; Cam A should have a full bite on Roller B. To adjust, form Throwout Lever at C. Note position of Lever D in Fig. 1. Lever D should clear Roller E; and, in Fig. 2, should have 100% bite. Adjust by forming.

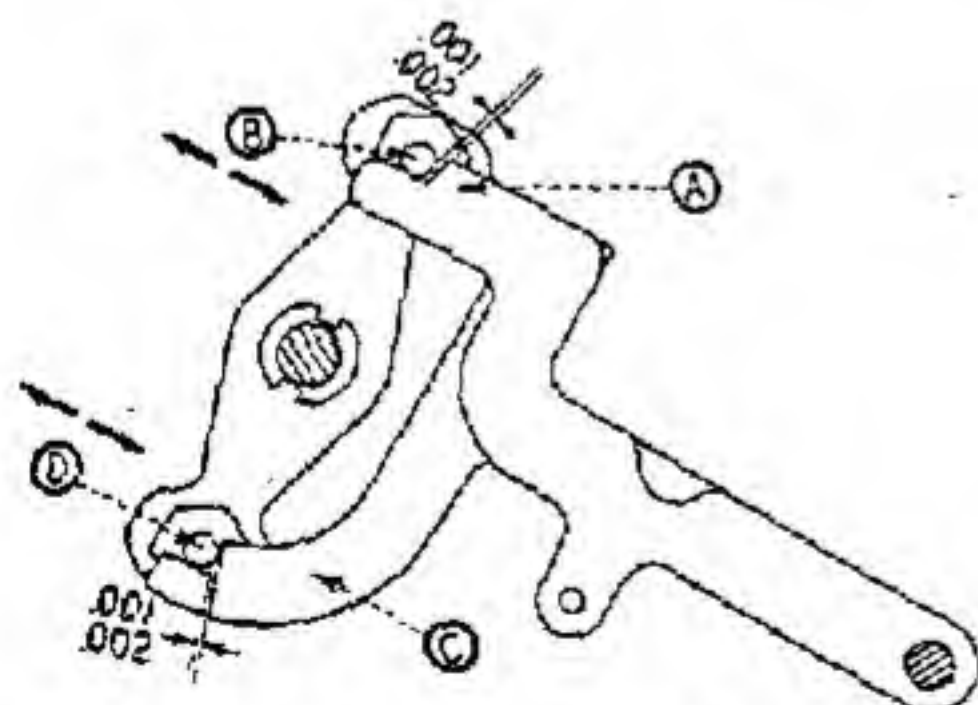
FRIDEN SERVICE doesn't COST the customer
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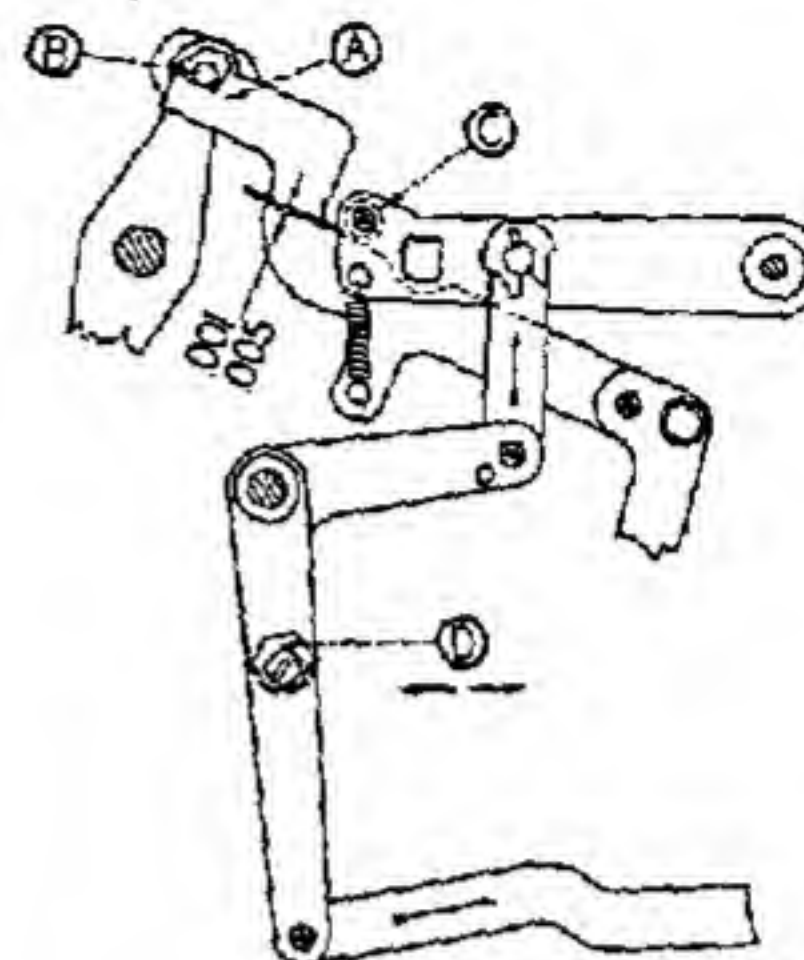
114. POWER SET LEVERS, FIRST ADJUSTMENT: Low point of Power Set Cam A should clear Roller B .005 to .015. Adjust by Eccentric Stop C.



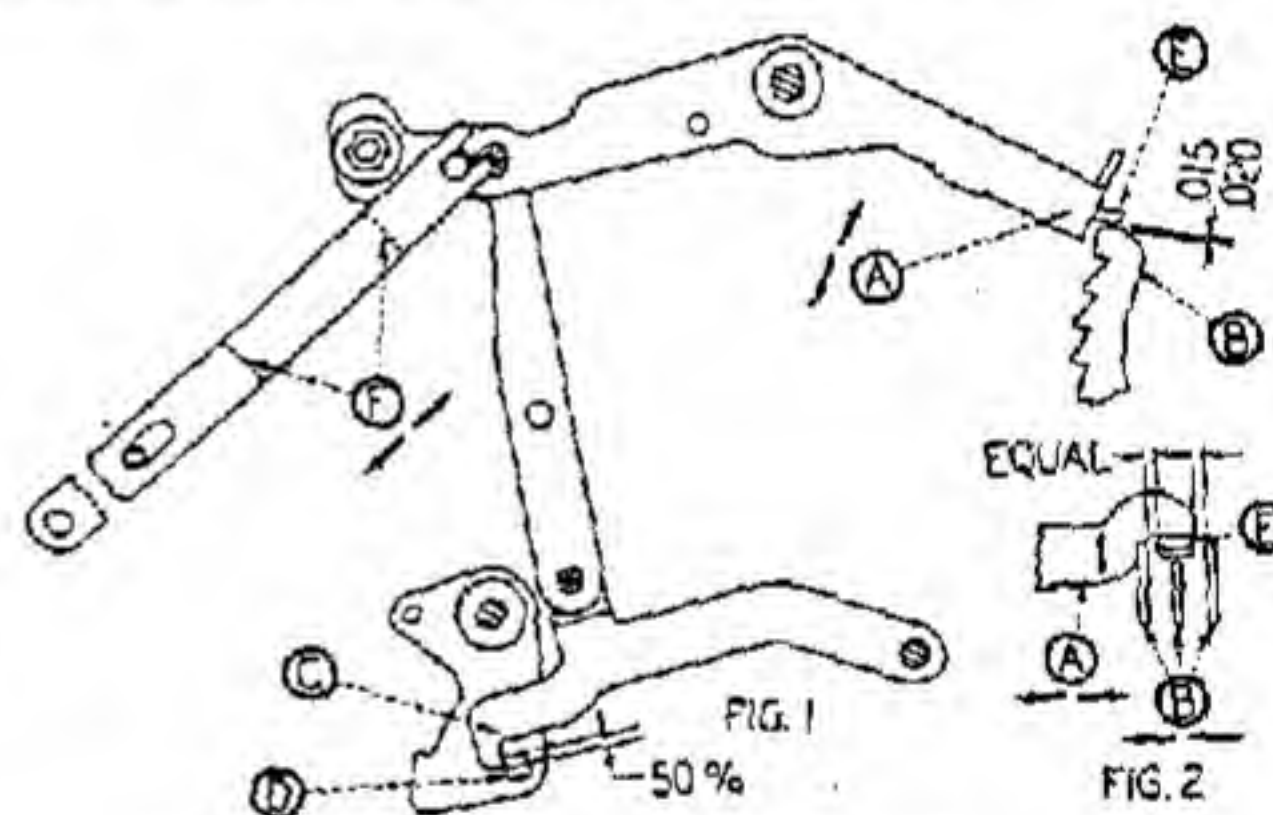
115. POWER SET LEVERS, SECOND ADJUSTMENT: With high point of Power Set Cam A on Roller B, Latch C should engage Square Stud D with approximately 75% bite. This Latch has a slight angle; and, if allowed to have a full bite on a slow operation, there may be motion in the Add-Subtract Gate while in Multiplication. Add just by Eccentric E. Note position of Eccentric E.



116. MULTIPLIER ADD-SUBTRACT GATE ACTUATING ARMS: Enter number in Multiplier Unit; depress Accumulative Multiplier Key. Upper Arm A should clear Stud B .001 to .002. With Negative Multiplier Key depressed lower Arm C should clear Stud D .001 to .002. Adjust Screw Studs B and D.

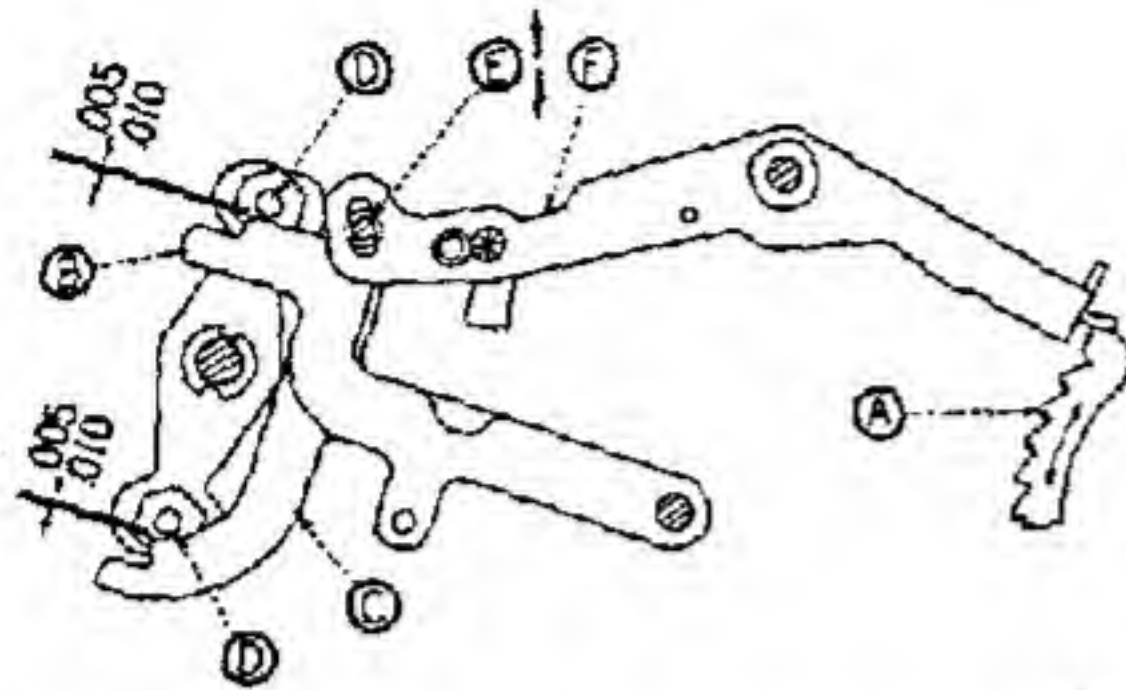


117. PLUS-MINUS GATE ACTUATING BELL CRANK: Enter number in Multiplier Unit; depress Multiplier Key. Upper Arm A should touch Screw Stud B and Roller C should clear Arm A .001 to .005. Adjust by Eccentric D.

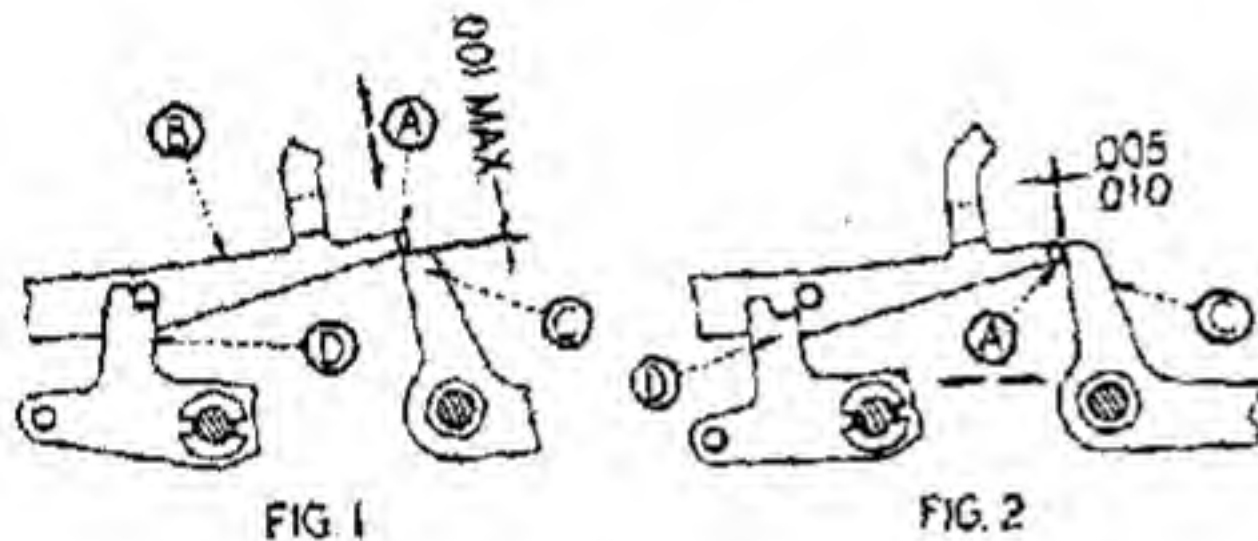


118. POWER SET DISABLING LEVER: Fig. 1. With zero in Multiplier Unit, press Disabling Lever A down against top of Segment B. Delatching Arm C should have at least 50% bite on square Stud D. Adjust by forming at A to raise or lower Lip E. In Normal Position, Lip E should clear top of Segments B .015 to .020. Adjust by forming Link F at points indicated by arrows to shorten or lengthen.

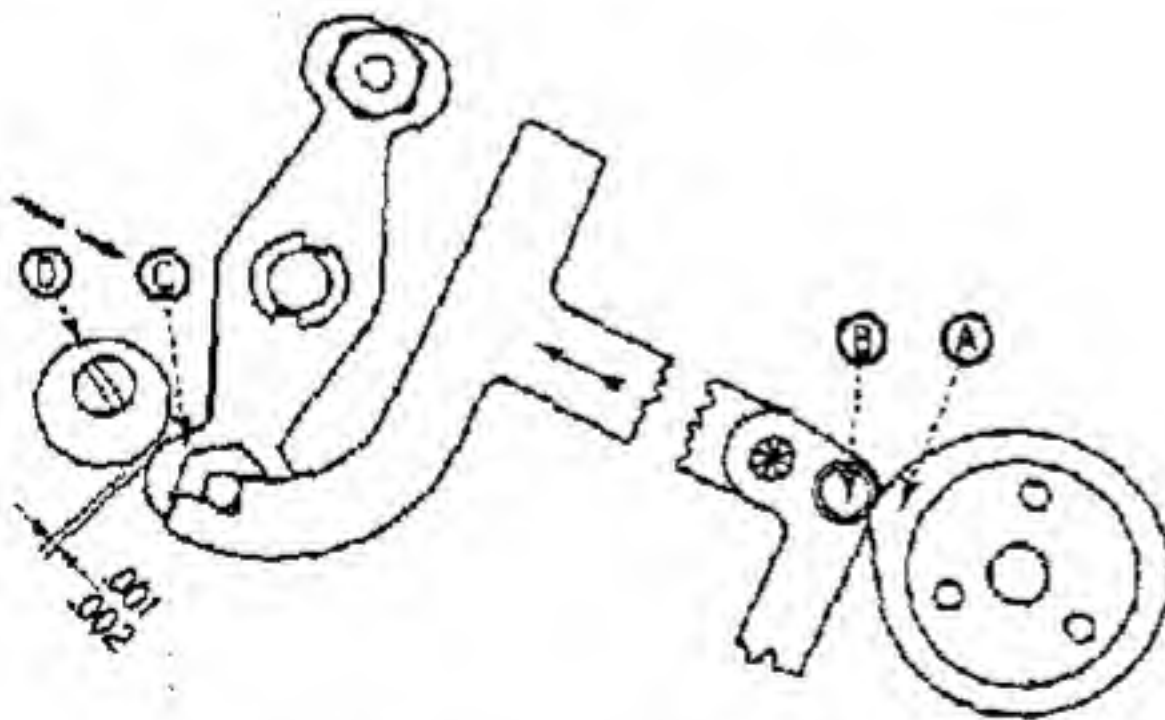
Fig. 2. With 01 in Multiplier Unit, Lip E should be centered on Segments B. Adjust by forming Lever A. Test in all positions. It is sometimes necessary to align Segments B.



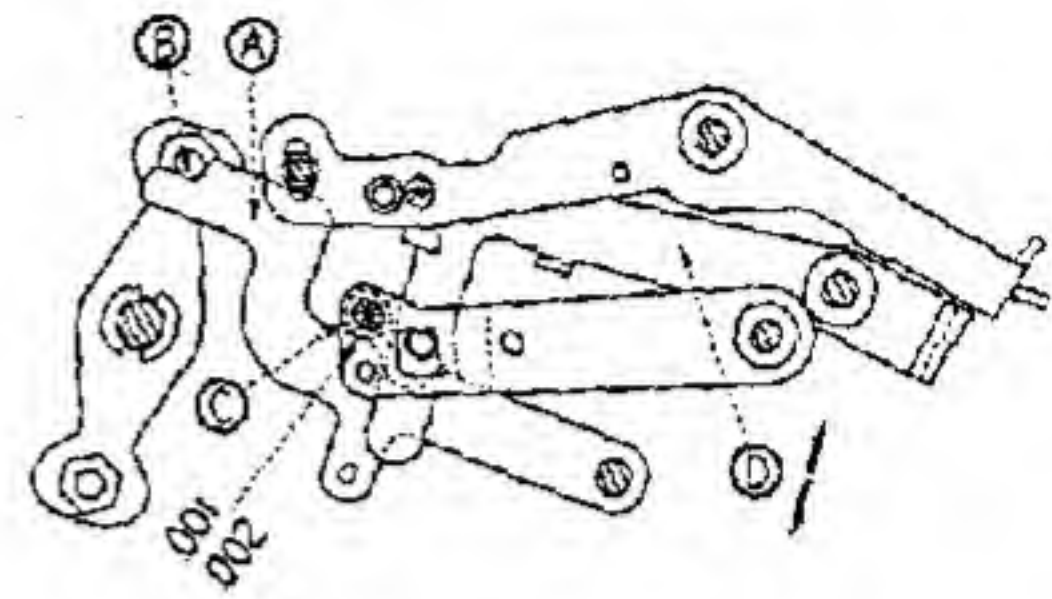
119. POWER SET DISABLING LEVER, SECOND ADJUSTMENT: When Multiplier Segment A is fed to zero, Positive and Negative Gate Levers B and C should clear Studs D .005 to .010. Adjust Stud E on Disabling Lever F.



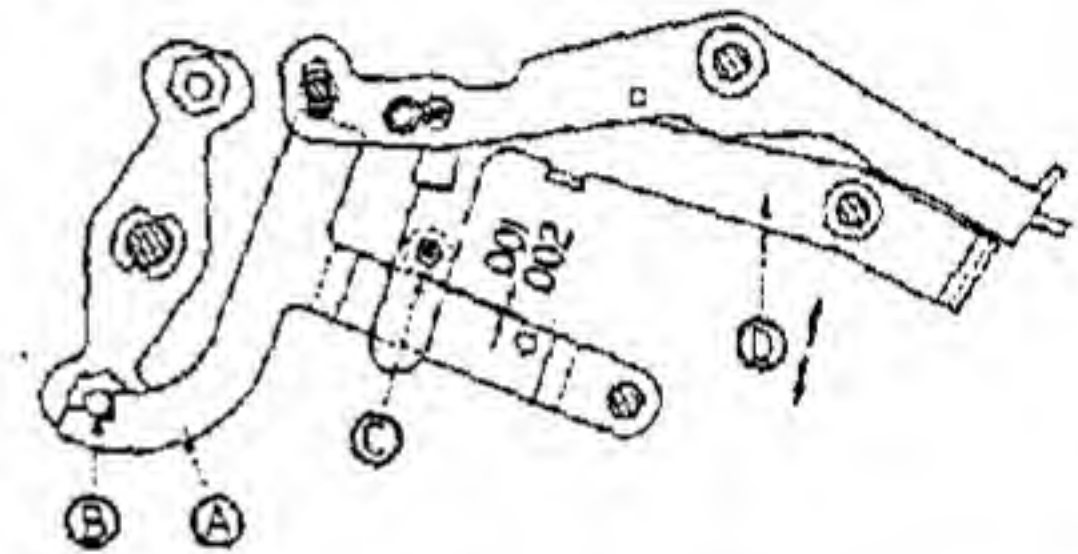
120. POWER SET CAM SHIFT LEVER: Fig. 1. In Normal Position, Lip A on Shift Lever B should clear Latch C no more than .001. Adjust by forming Lip A up or down.
Fig. 2. With Latches C and D delatched, Lip A should clear Latch C .005 to .010. Adjust by forming Lip A forward or rearward.



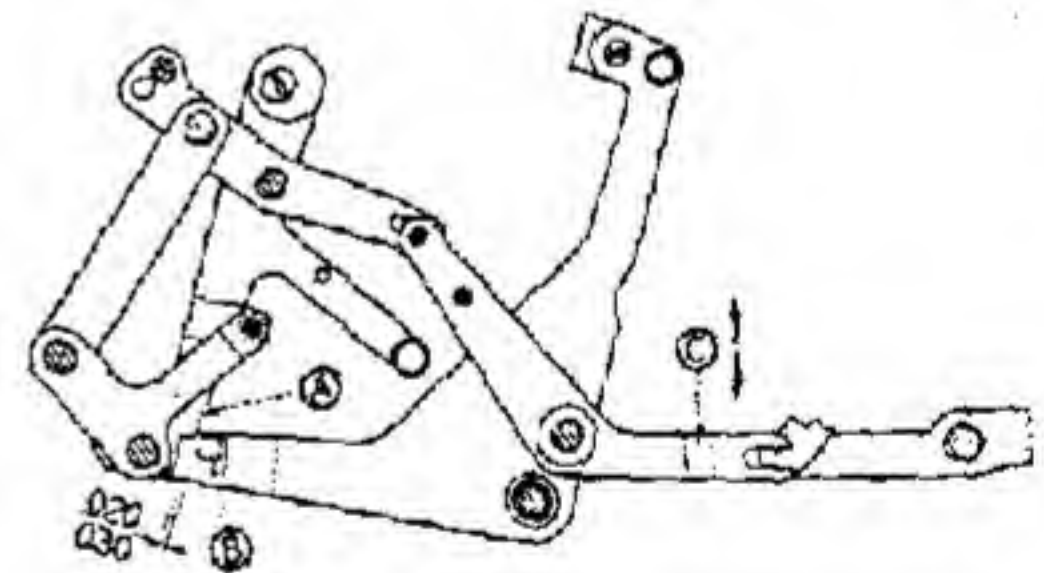
121. MINUS STOP FOR ADD-SUBTRACT GATE (NEGATIVE MULTIPLIER): Machine in Negative Multiplication and high point of Cam A on Roller B, there should be no more than .002 clearance between Arm C and Stop D. Adjust by Eccentric Stop D.



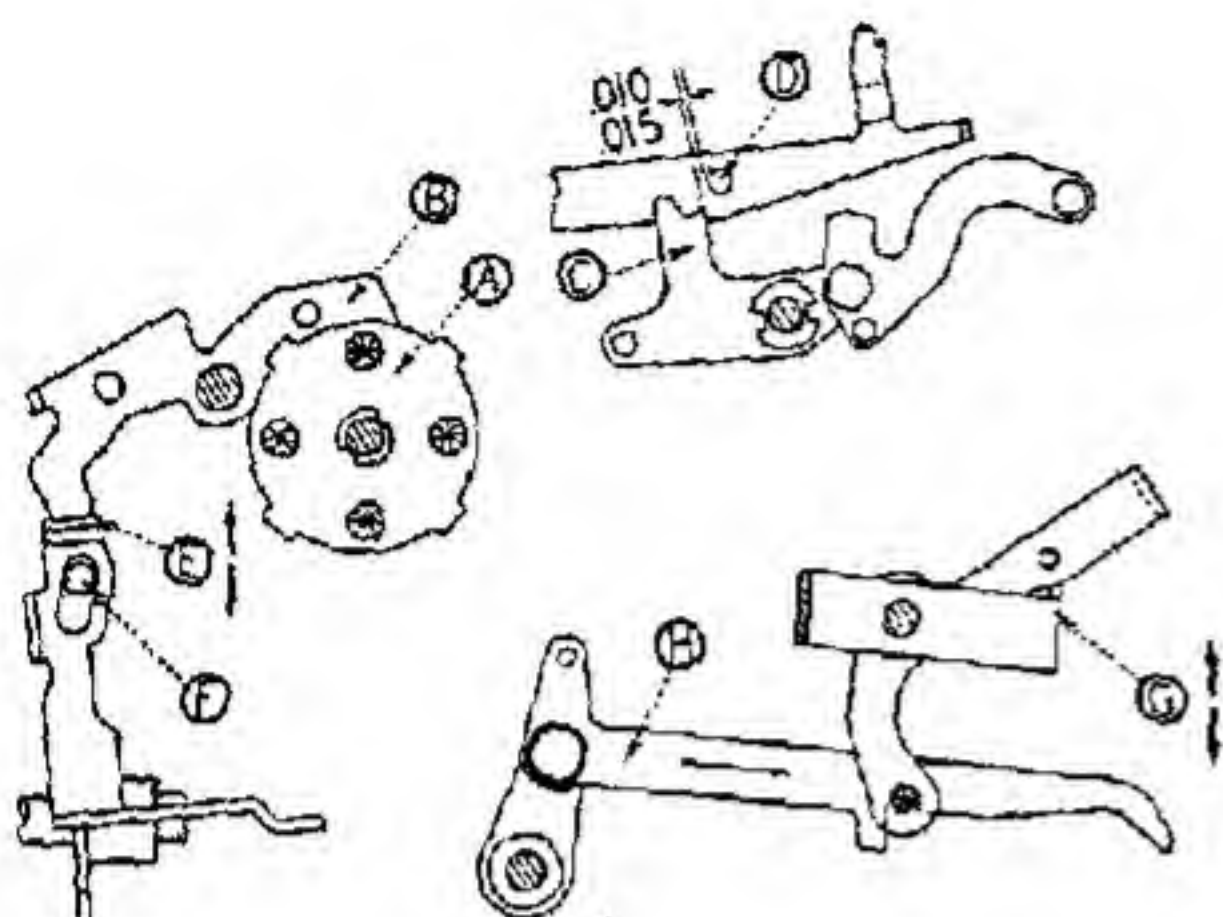
122. MULTIPLIER BAR LEVER: With number in Multiplier Unit and Accumulative Multiplier Key depressed, Lever A should touch Stud B. Roller C should clear Lever A .001 to .002. Adjust by forming Lever D.



123. NEGATIVE MULTIPLIER BAR LEVER: With number in Multiplier Unit and Negative Multiplier Key depressed, Lever A should touch Stud B. Roller C should clear Lever A .001 to .002. Adjust by forming Lever D.

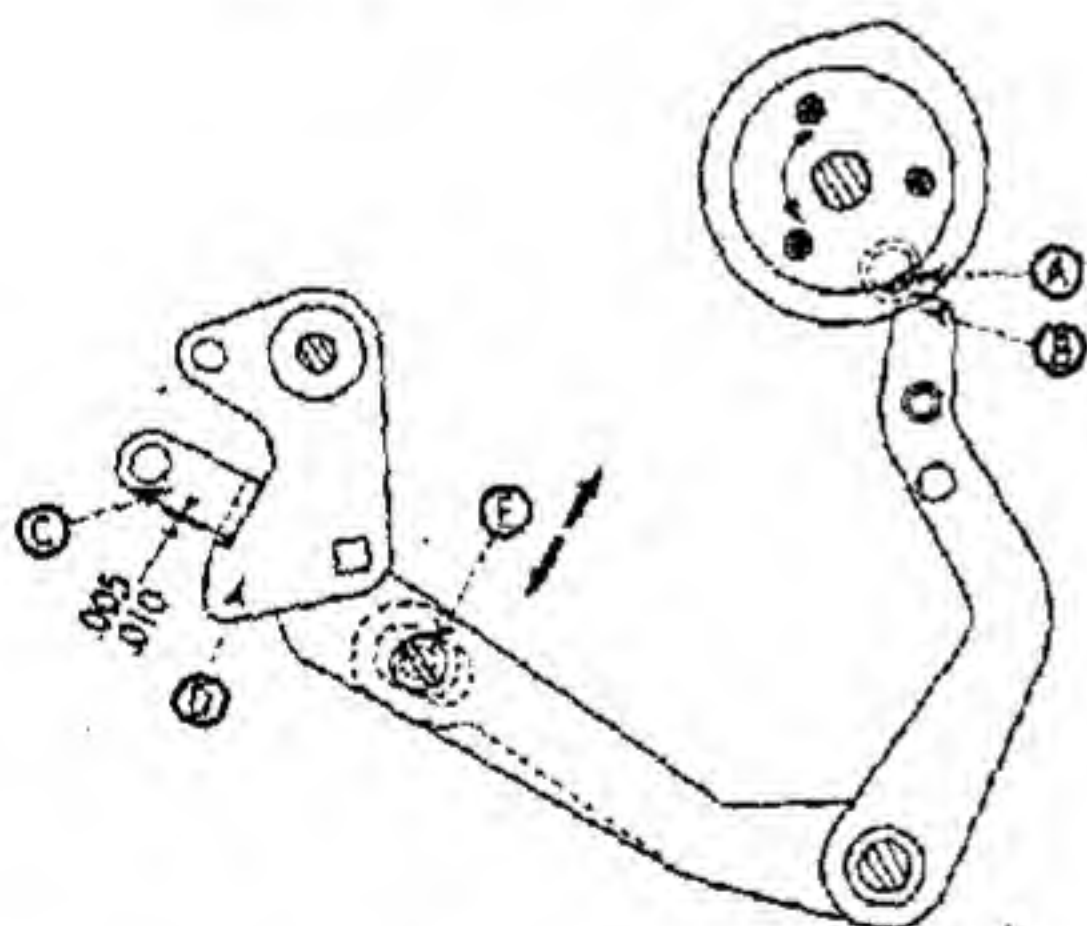


124. MULTIPLIER RESTORE LATCH CONTROL LEVER: In Normal Position, Latch A should clear Square Stud B .020 to .030. Adjust by forming Control Lever up or down at C.

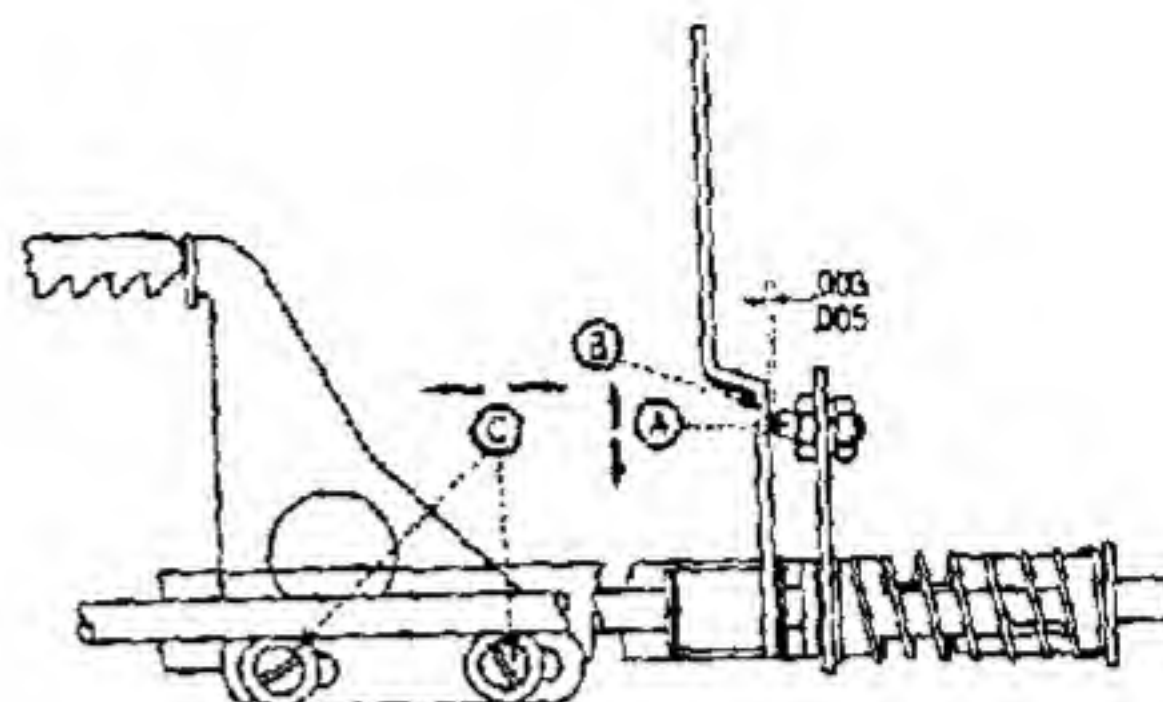


125. AUTOMATIC CLEAR DISENGAGING SLIDE: When Shift Gear A is on high point on Override Pawl B, there should be .010 to .015 clearance between Latch C and Stud D. Adjust by forming Lip of Slide E. Slide E should not bottom on Screw F. If proper delatching of Latch C cannot be obtained by this adjustment, adjust Lever G upward to obtain more throw on Latch Actuator H.

c. CARRIAGE SHIFT

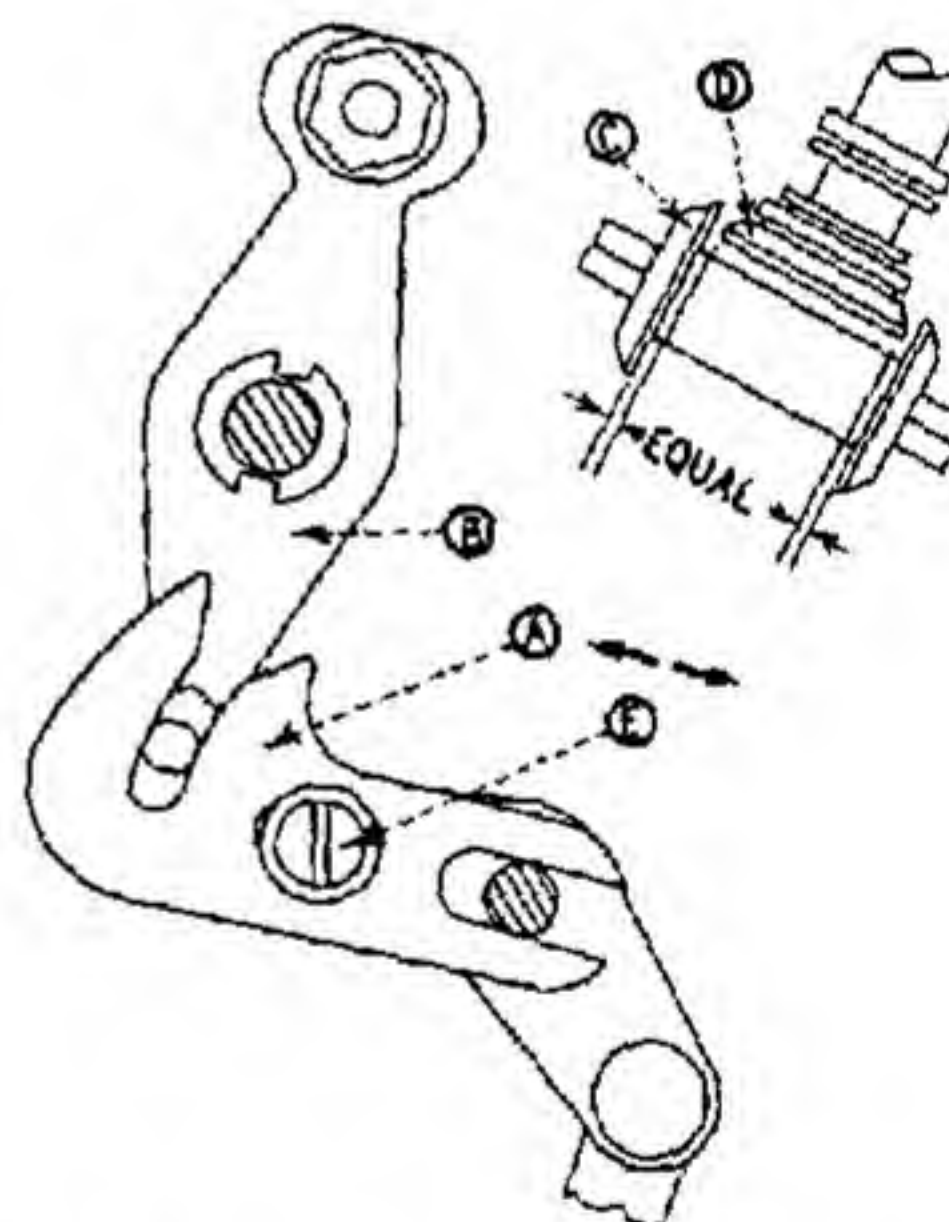


126. POWER SET LATCH RELEASE LEVERS (MULTIPLIER CARRIAGE SHIFT): With Roller A on high point of Lever B, Lever C should overlap Latch D .005 to .010. Adjust by Eccentric E.



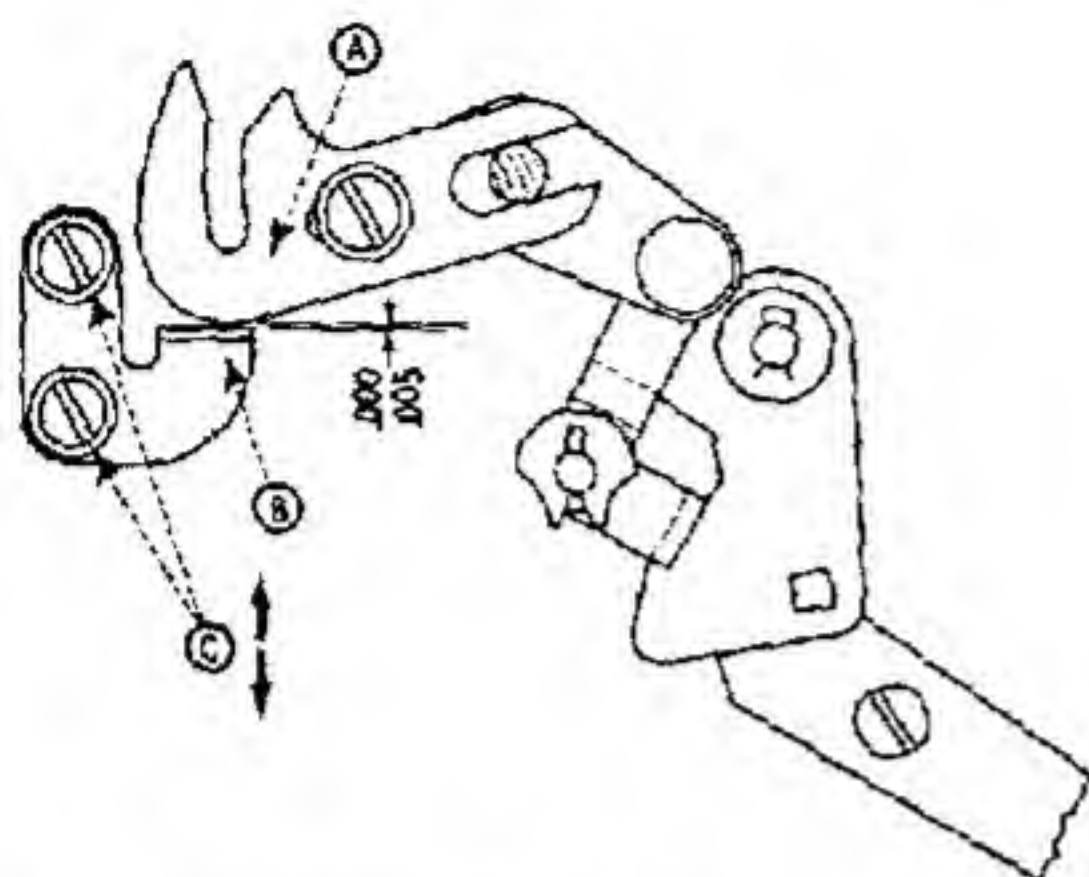
127. CARRIAGE SHIFT THROWOUT ARM: Enter single number in first position of Multiplier Unit, pull Multiplier Repeat Key down and Multiply out. Stud A should miss Arm B and have .003 to .005 clearance. Adjust Disabling Bracket at C.

With two or more numbers in Multiplier Unit, Stud A should move over Arm B with .002 to .005 clearance. Stud A is Eccentric for this adjustment.

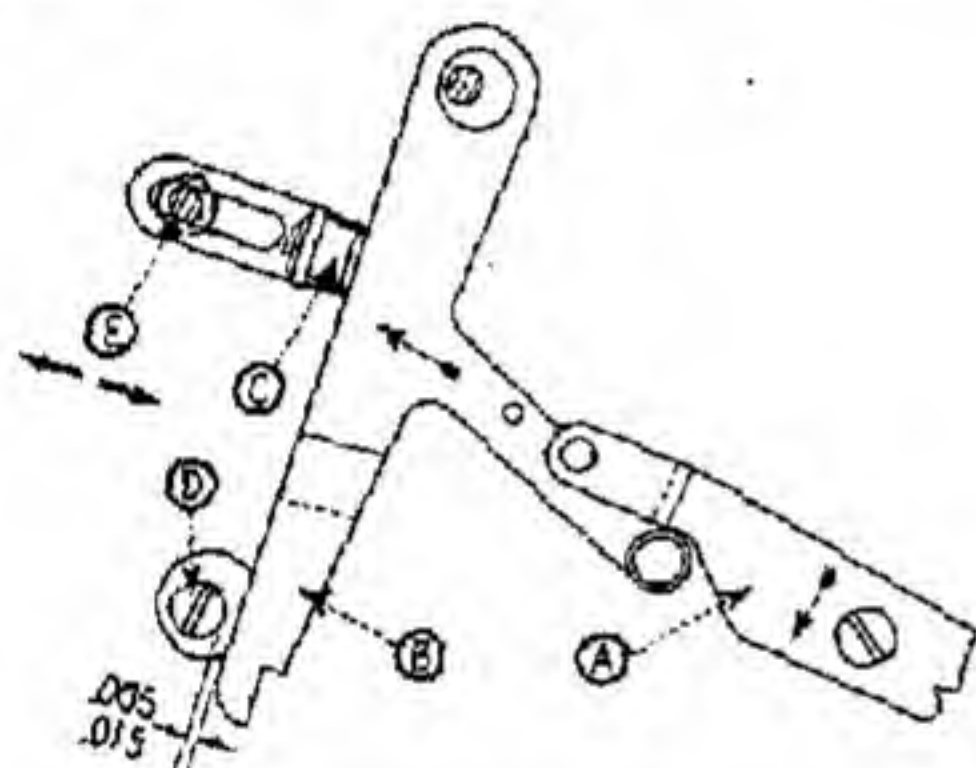


128. PLUS - MINUS GATE STABILIZER: When Stabilizer A is tripped, Gate B should be held so there is equal clearance between Add and Subtract Gears C and both sides of Product Dial Gears D. Adjust at E.

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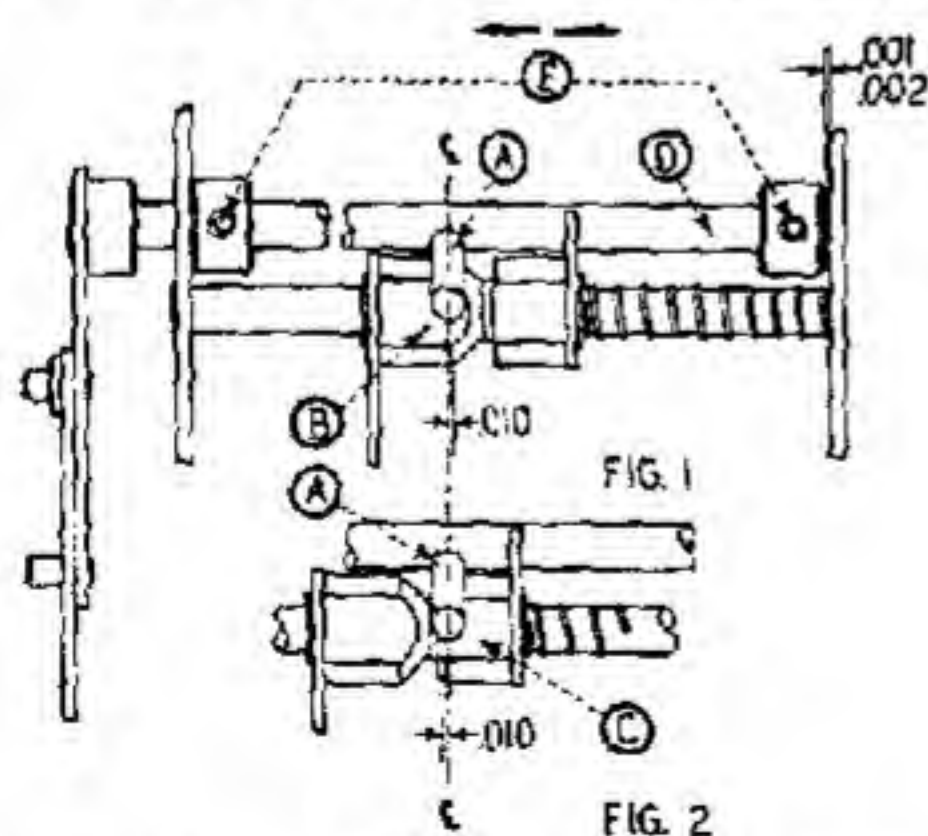


129. POWER SET LATCH BUMPER: Stabilizer A in Normal Latched Position, Bumper B should touch lightly or may have up to .005 clearance. Adjust at C.



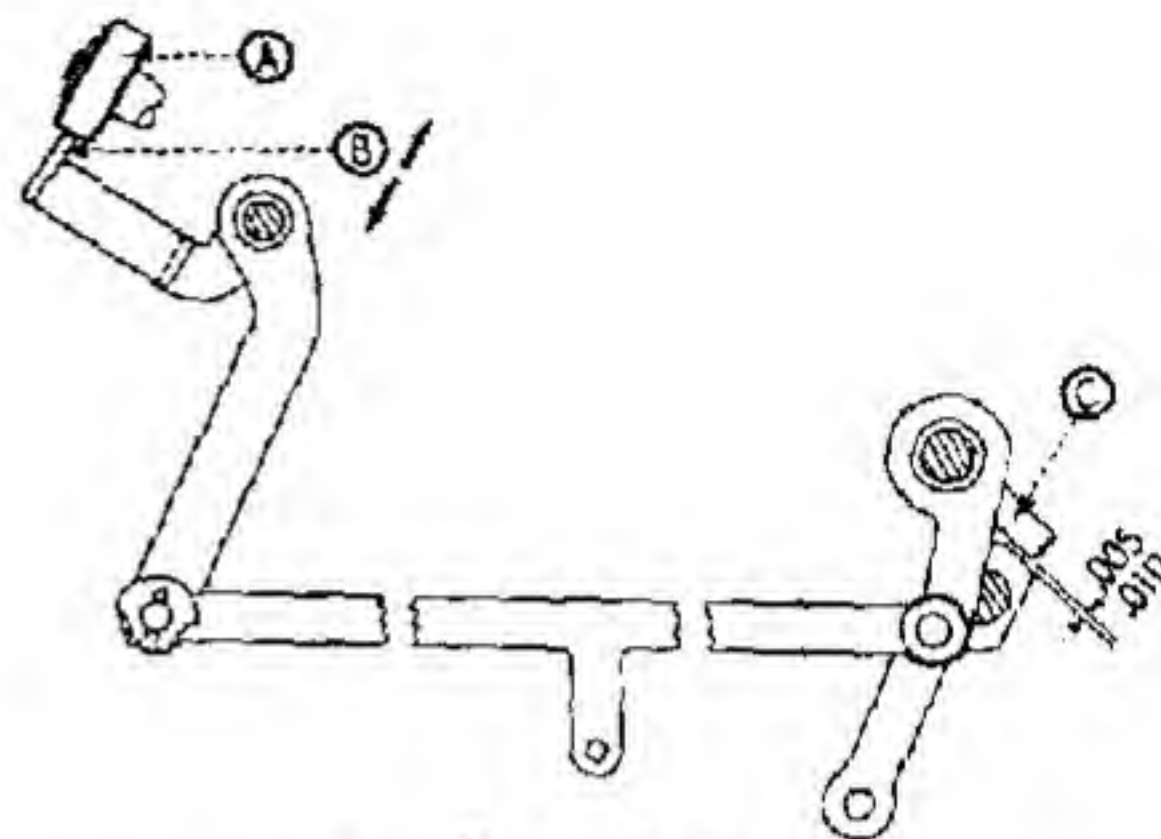
130. STOP FOR POWER SET LATCH: When Lever A is tripped, Power Set Latch B should contact Stop C before hitting head of Screw D. Adjust at E.

d. INSTANT CARRIAGE RETURN



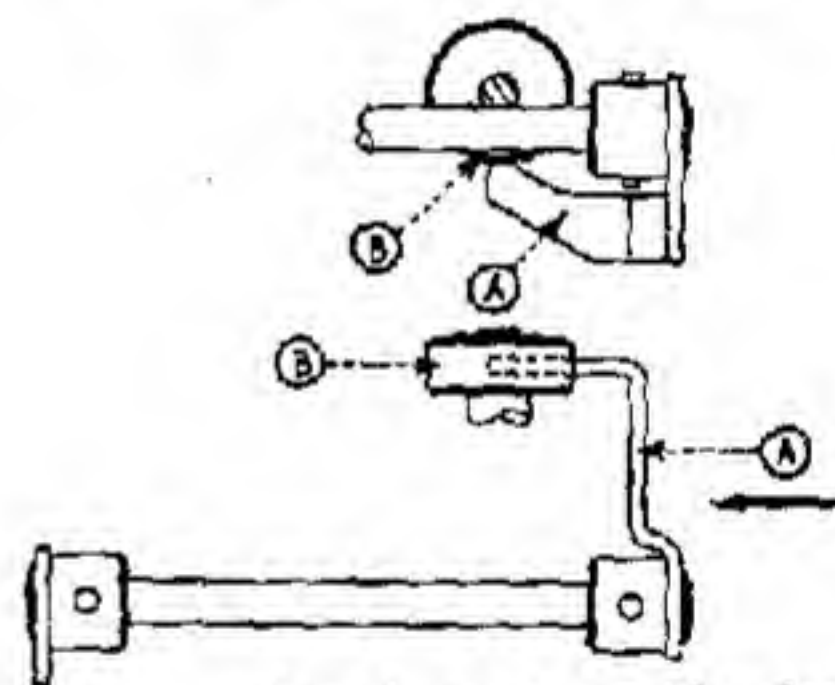
131. MULTIPLIER UNIT KEYS SHIFT CONTROL SHAFT: Fig. 1. Unit in Home Position, there should be .010 between center line of Stud A and edge of Hub B. Fig. 2. With Unit spaced one position, there

should be .010 between center line of Stud A and edge of Hub C. Adjust by spacing Shaft D to right or left with Collars E. There should be no more than .002 end play in Shaft D, which must be perfectly free.



see Page 64A

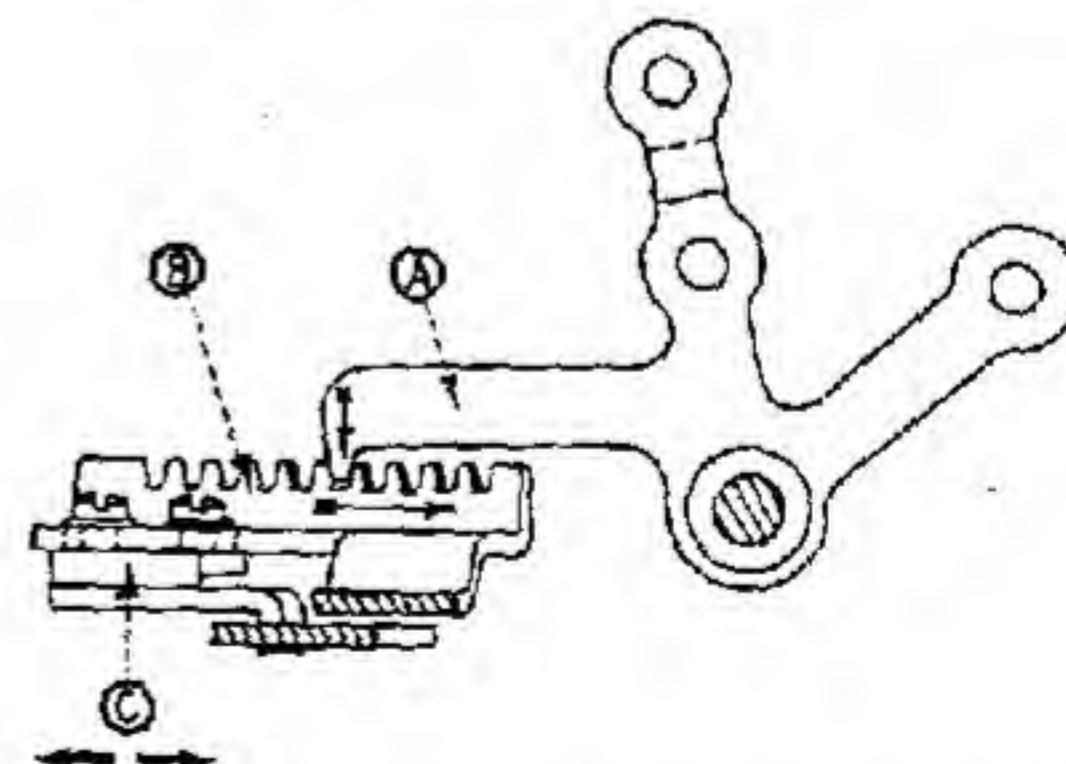
132. RESTORE AND ACTUATING ARMS: With Roller A on B, Stud C should clear Hub D .005 to .010. Adjust by forming Lever B.



New adjustment eliminates this

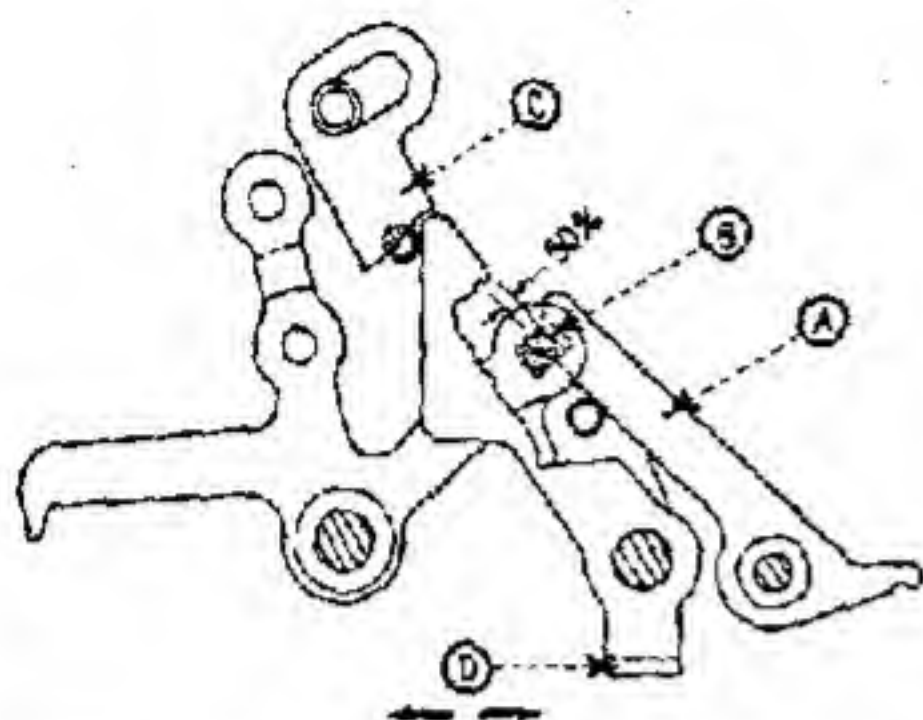
133. RESTORE LEVER: With Add Key down, if Key Board clears on Instant Carriage Return operation, adjust Lever A to the left. Note that Lever A has full contact on Roller B.

e. REPEAT MULTIPLICATION

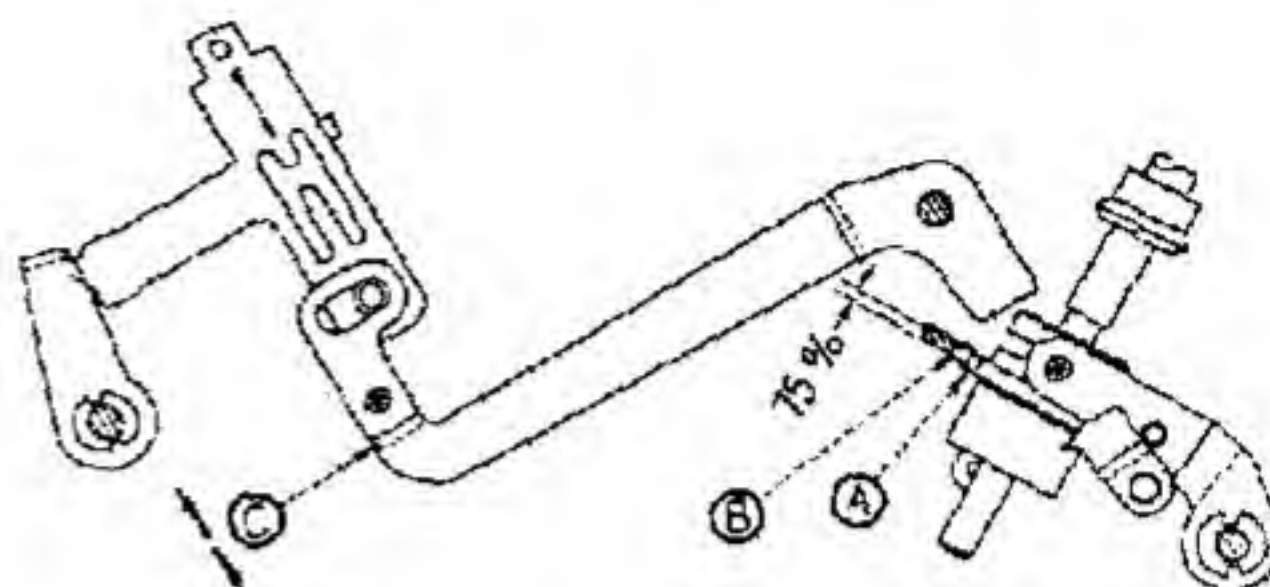


134. MULTIPLIER UNIT POSITION SELECTOR: When Lock A engages Selector B, Selector B should move rearward slightly to take up slack in Unit. Adjust Bracket C.

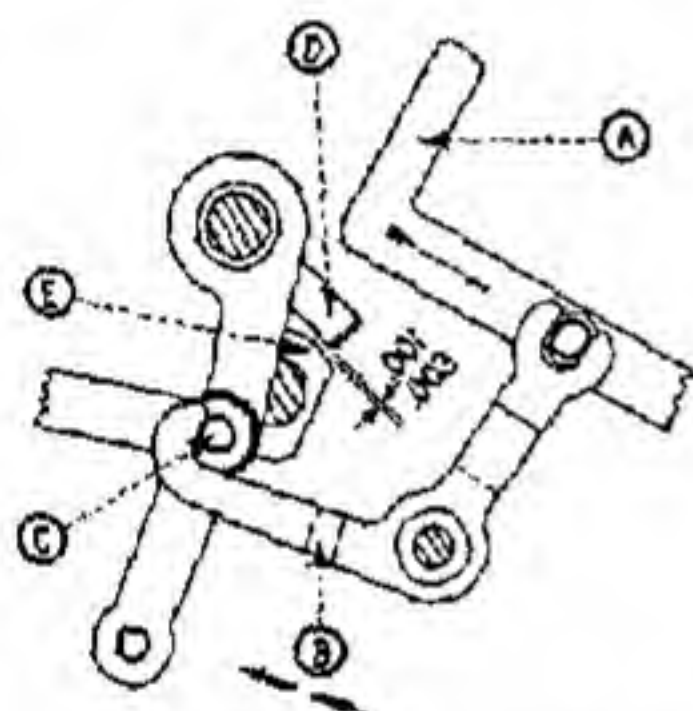
I. MULTIPLIER CONTROL KEYS



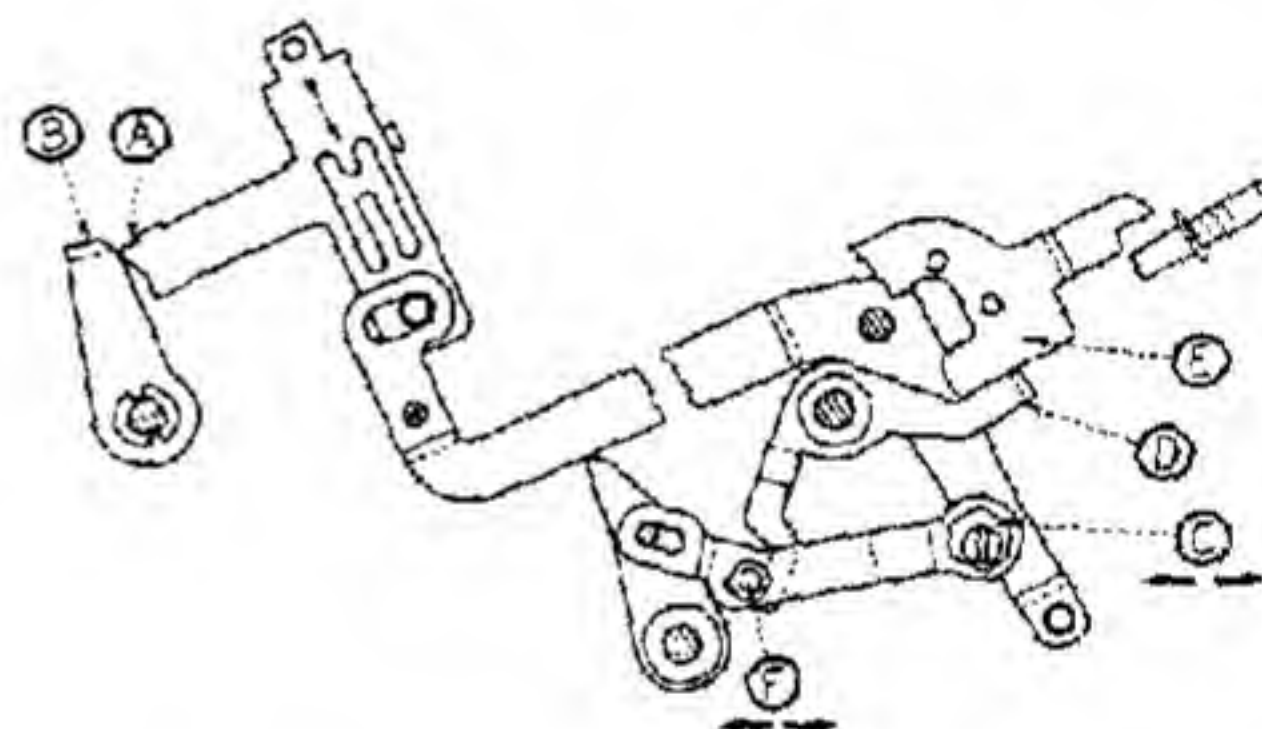
135. CONSTANT MULTIPLIER DELATCHING BAIL: When the Repeat Multiplier Key is pulled down, Latch A should engage Square Stud B with approximately 50% bite. To test this adjustment, depress Multiplier Clear Key C slowly. Latch A should release safely before Main Clutch releases. Adjust by forming Bail at D.



138. MULTIPLIER CORRECTION KEY LEVER: With Multiplier Clear Key depressed, Shift Pawl A should engage tooth of Unit Shift Rack B at least 75%. When Multiplier Clear Key is bottomed, Pawl A should not go more than 50% above Rack B. Adjust by forming Lever at C.

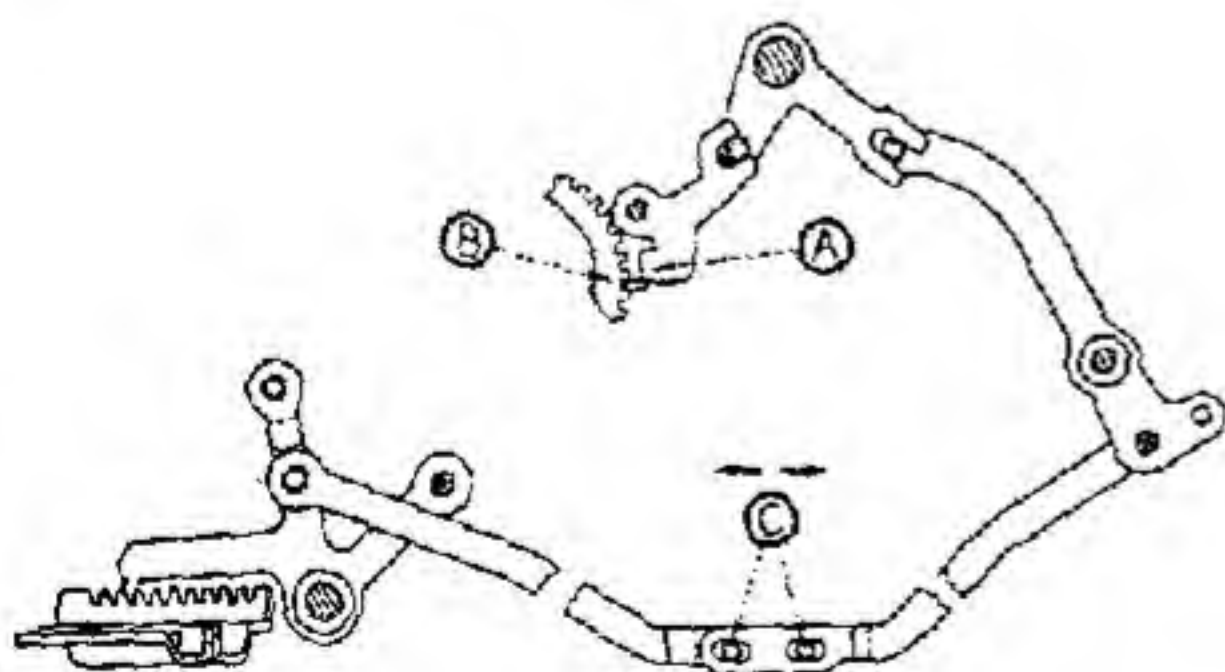


136. MULTIPLIER UNIT KEYS SHIFT DISABLING LEVER: With multiplier Repeat Key A down, Lever B should latch on Stud C and hold Stud D clear of Hub E when Carriage is to the right of second position. Adjust by forming at B.

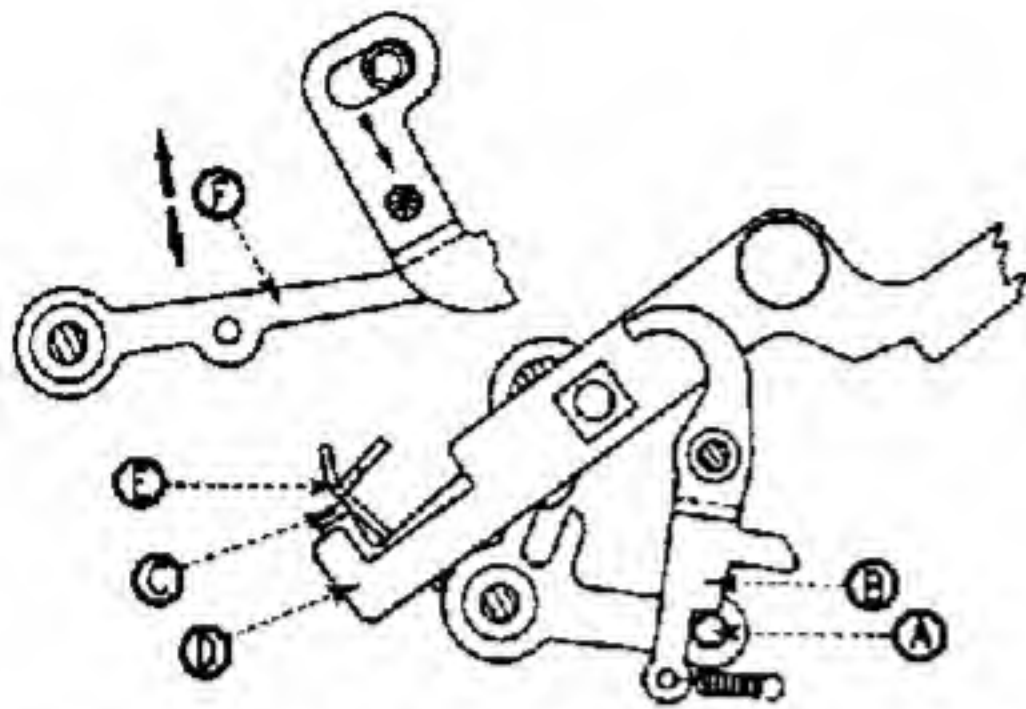


139. CORRECTION KEY CLUTCH OPENER LINK: As Multiplier Clear Key A is slowly depressed, Main Clutch should release immediately before Key A latches under Latch B. Adjust by Eccentric C.

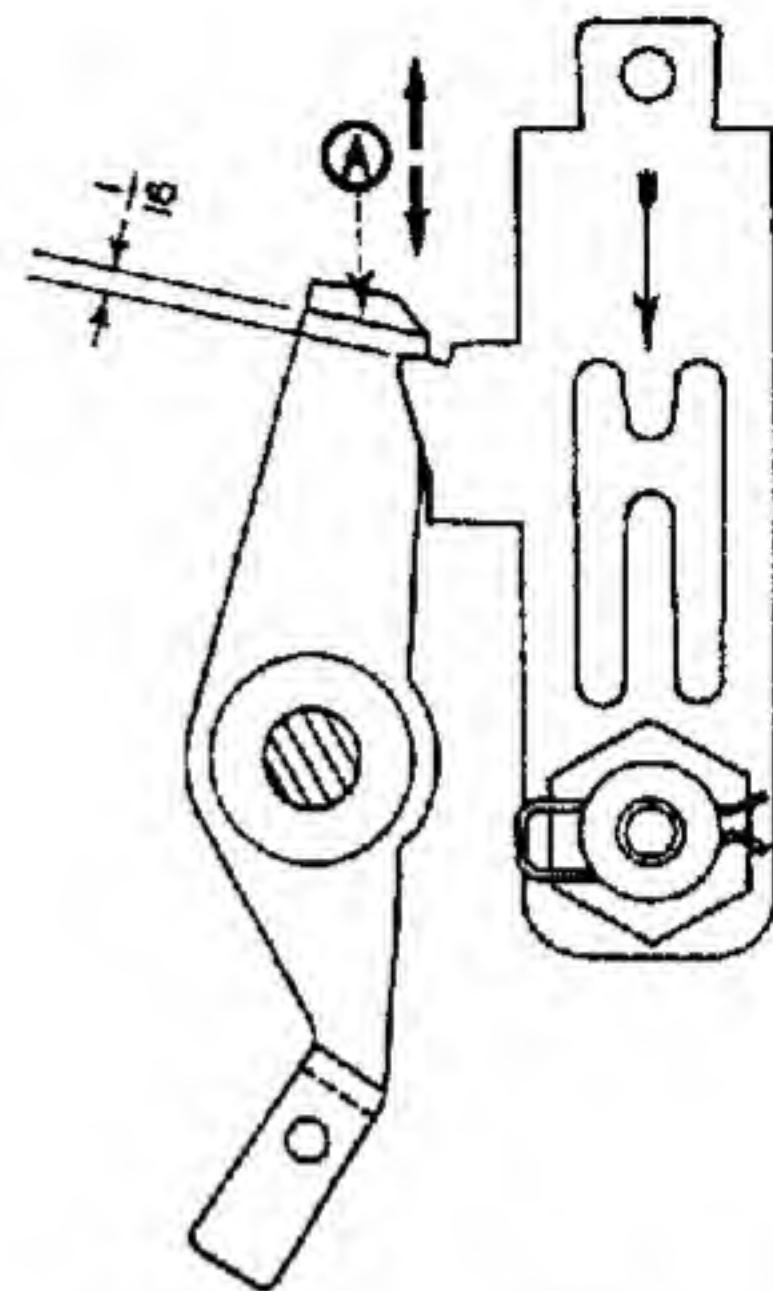
In Home Position, Lever D should lightly touch Engaging Link E and Stud F without raising Link E. Adjust at Stud F.



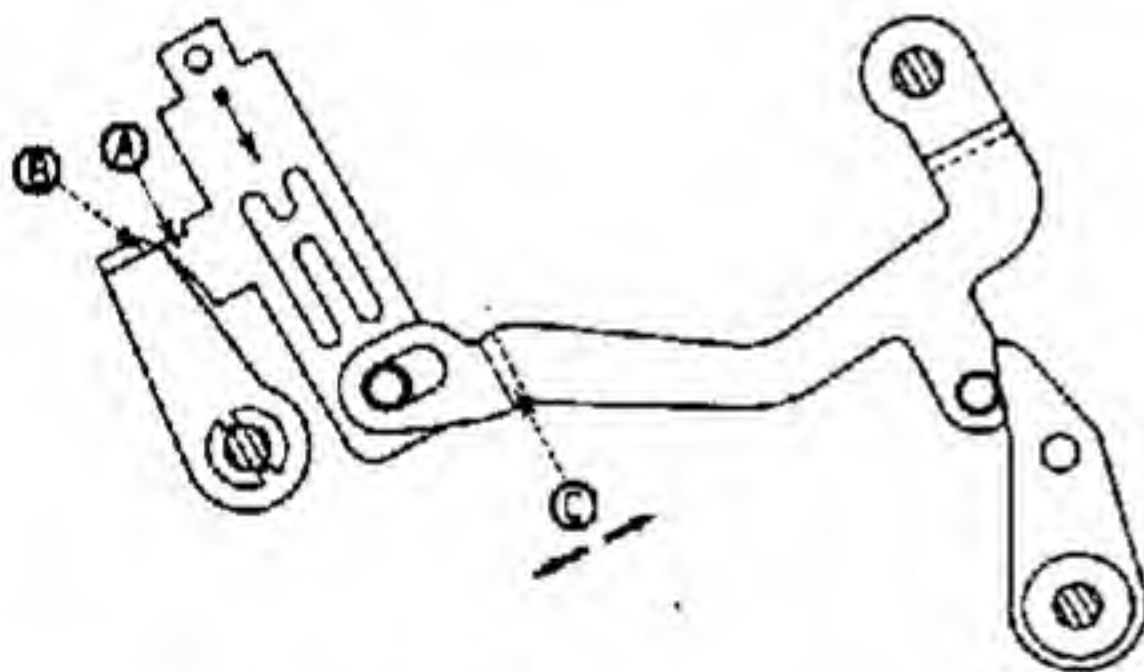
137. CONSTANT MULTIPLIER SEGMENT RING LOCK BAIL: When Repeat Multiplier Key is down, Bail A should engage Segment Ring B with full bite but without bottoming. Adjust at Slip



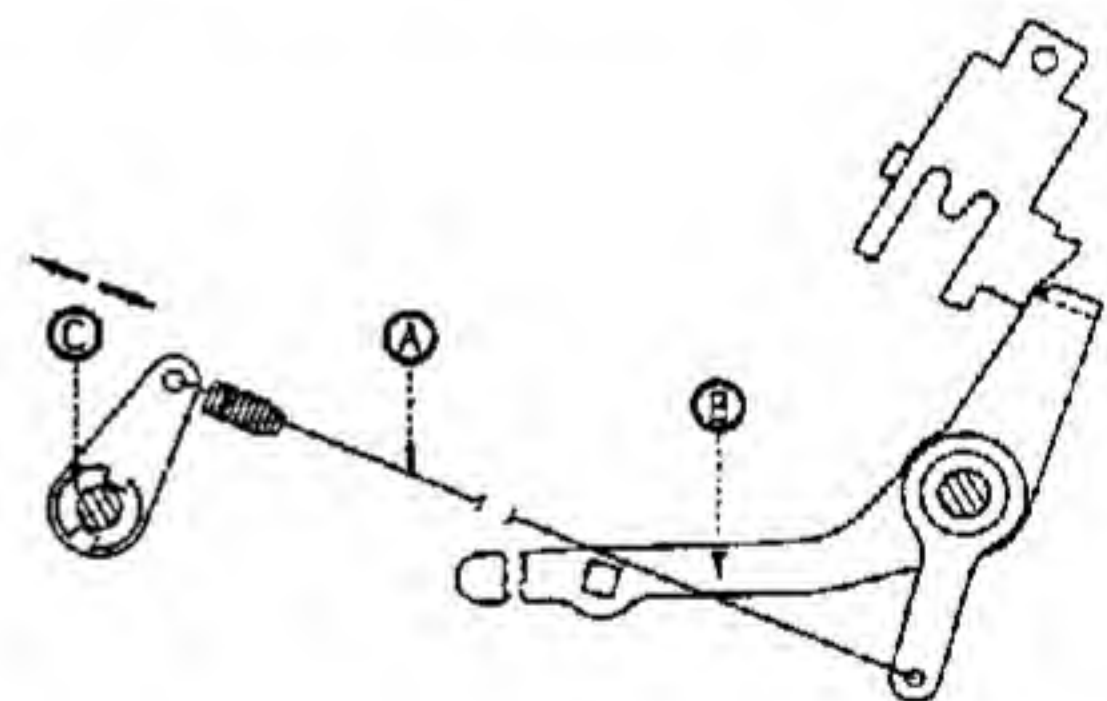
140. MULTIPLIER CLEAR KEY BOARD CLEAR DISABLING MECHANISM: With Multiplier Clear Key depressed, Stud A should be slightly below latching point on Latch B. Lever C holds Clear Link D below Lip on Clear Gate E. If Key Board clear on Multiplier Clear operation, check parts for freeness and springs for proper action. Lip of Clear Gate E may have been bent downward in an attempt to correct other clearing troubles and is low enough that Lever C does not disable Link D when Multiplier Clear Key restores and Stud A drops on to Latch B. Latch B is disabled when Add Key is up. If Stud A does not latch on Latch B, form Lever F.



142. LATCH FOR MULTIPLIER KEYS: When any of the Multiplier Keys is depressed, there should be no more than 1/16" overtravel after latching. Adjust by forming Latch Lip A.

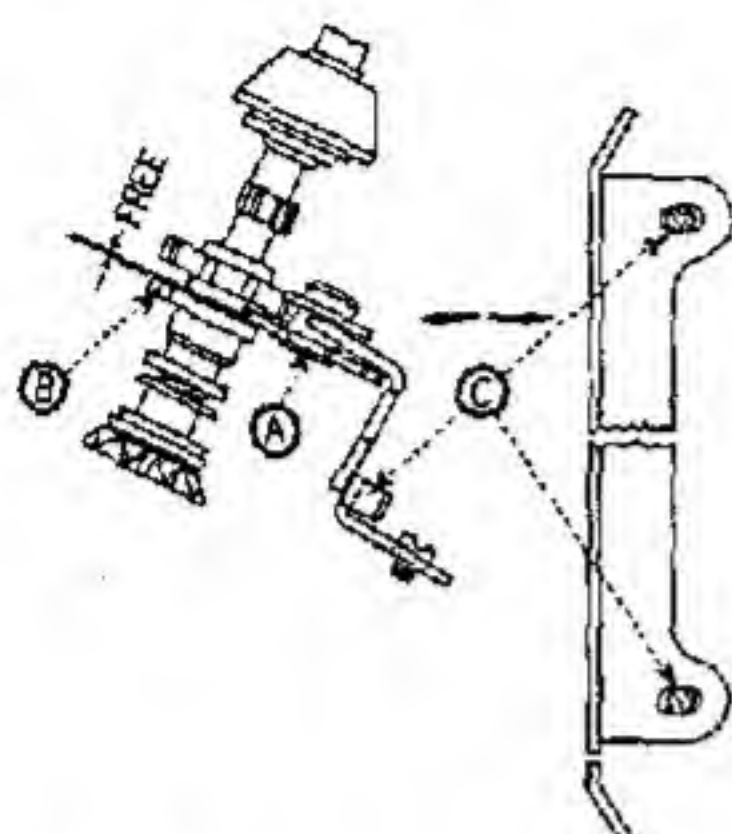


141. MULTIPLIER RETURN CLEAR LEVER: When Multiplier Key is depressed slowly, Clutch should release immediately before Multiplier Key A latches under Latch B. Adjust by forming Lever at C.

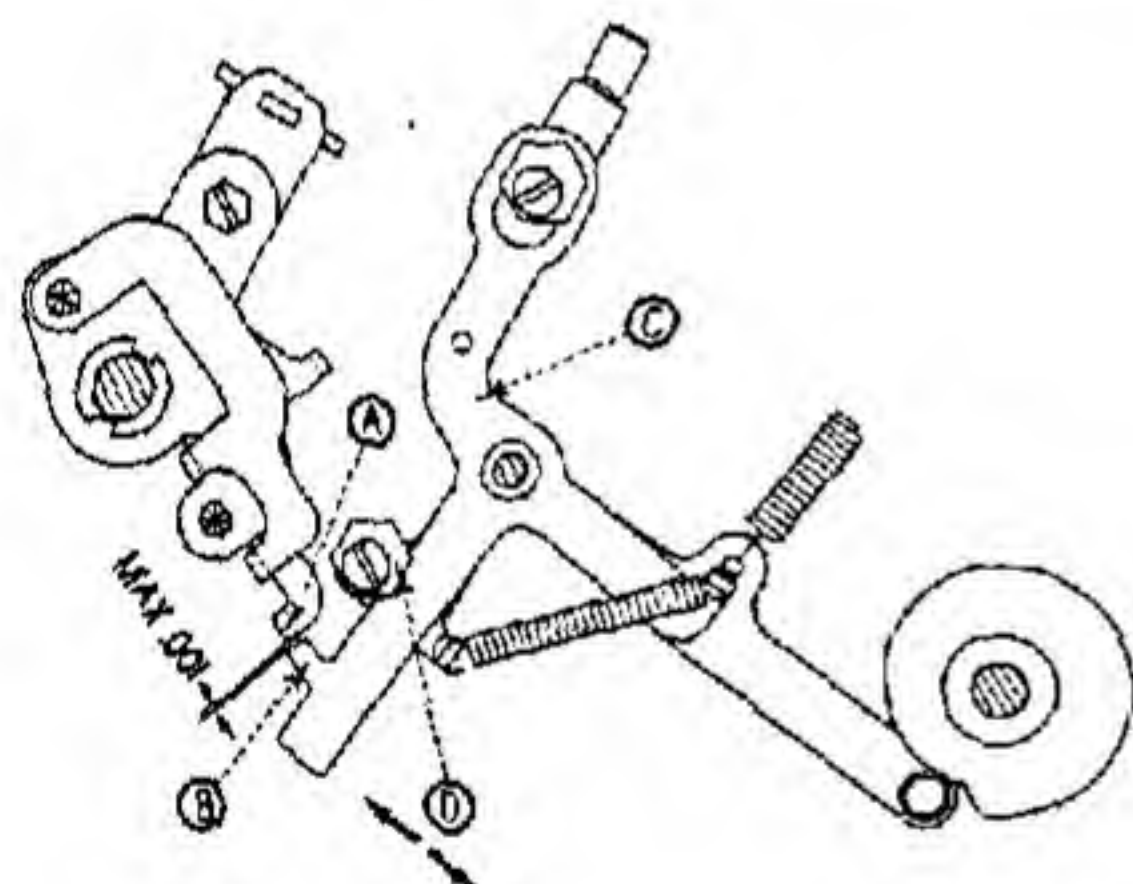


143. MULTIPLIER KEYS RELEASE LEVER: With Multiplier Unit spaced one or two spaces, Spring Wire A should be taut but should not move Lever B. Adjust Lever C.

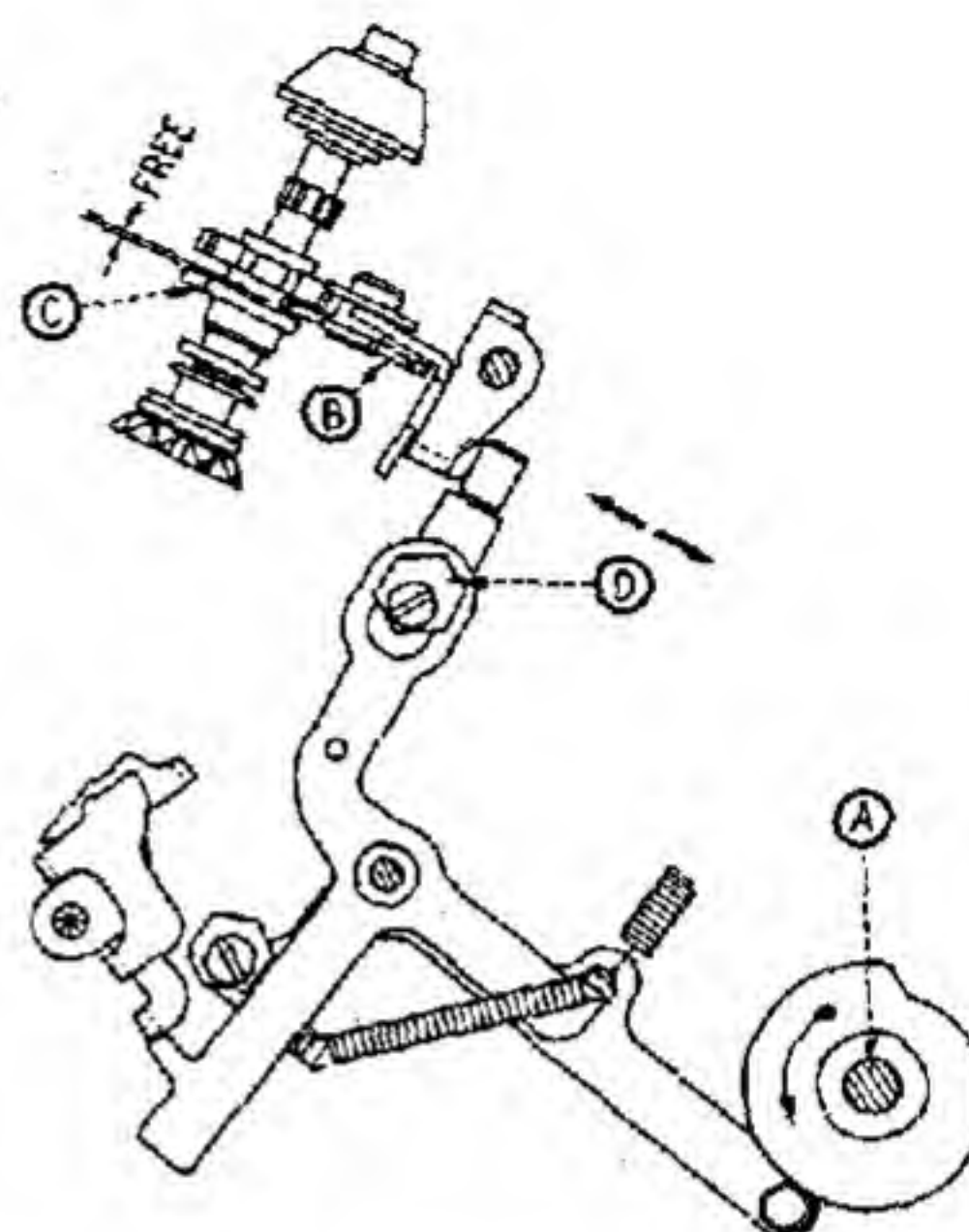
α. COMPLETE TRANSFER



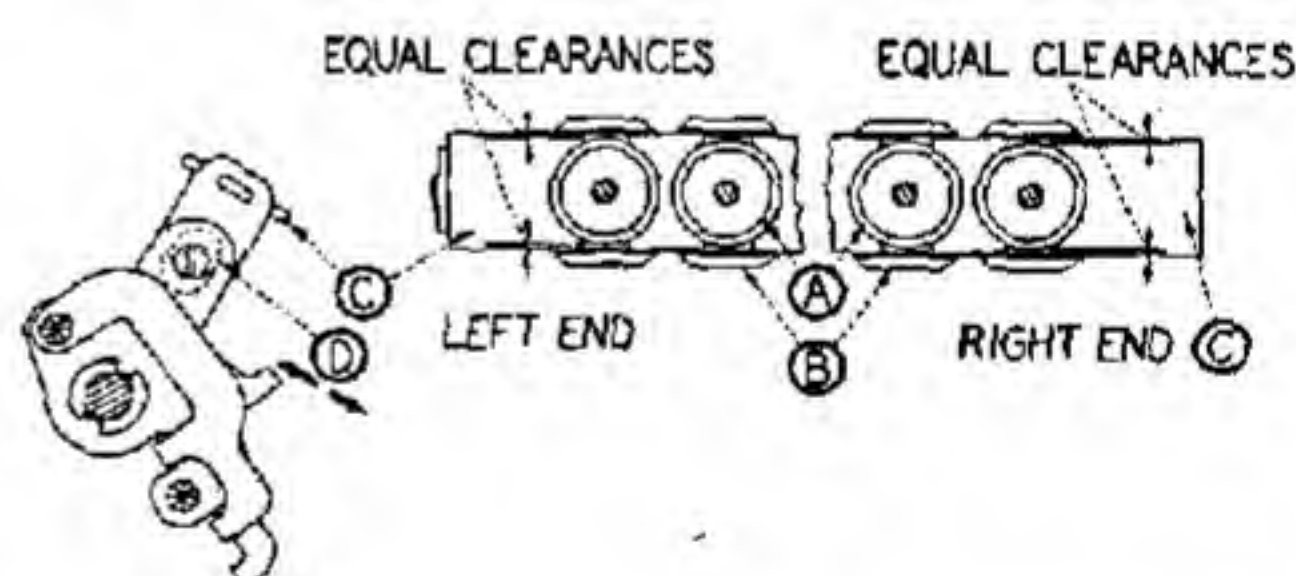
144. COMPLETE TRANSFER BLOCKOUT - IN-BOARD ORDERS: Carriage in extreme Right Position, all Idler Gears A should be disengaged from Transfer Gears B. Adjust by Blockout C. Keep adjustment even. If Gears A are too low, Dials will attempt to transfer; and if too high, Dials will tend to bind. See Complete Transfer Test at end of this section.



145. COMPLETE TRANSFER DISENGAGING ARM (SEQUENCE ADJUSTMENT): Machine in Home Position, there should be no more than .001 clearance between Lever A and projection B on Lever C. Adjust by Eccentric D. VERY CLOSE ADJUSTMENT.

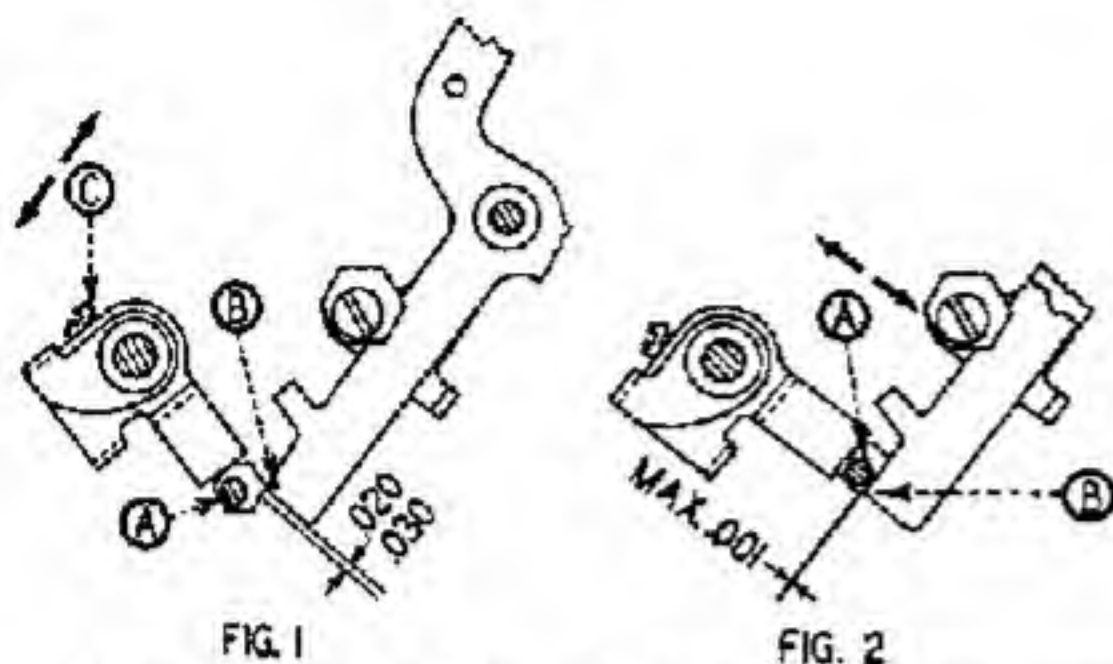


146. DISENGAGING ARM, SECOND ADJUSTMENT: Machine in Shift operation and Drive Shaft A at half turn, Idler Gears B should clear Transfer Gears C. Adjust by Eccentric D. If Idler Gears B are too low, Dials will attempt to transfer when spun; if too high, Dials will tend to bind. VERY CLOSE ADJUSTMENT.

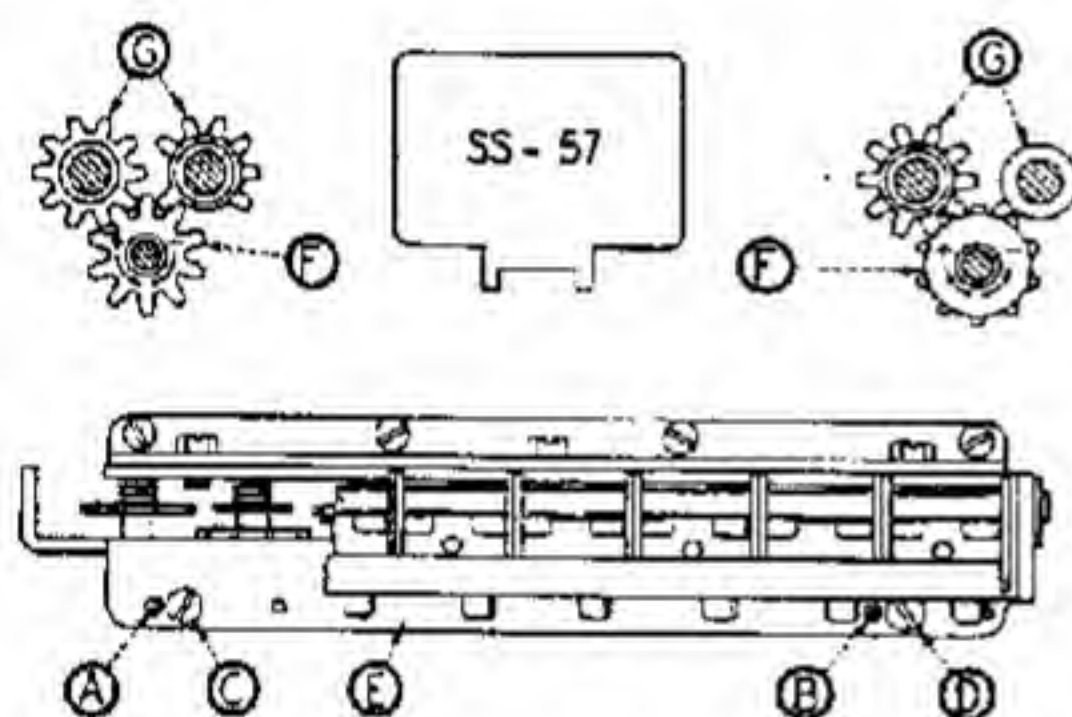


147. ADD - SUBTRACT GATE, COMPLETE TRANSFER: Gate in proper alignment, there should be equal clearances between Product Dial Gears A and Add-Subtract Gears B at both ends of Gate C. Adjust by Eccentric D.

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148. BLOCKING ARM FOR DIVISION, COMPLETE TRANSFER: Fig. 1. In Home Position, Eccentric Screw Stud A should clear bottom of Arm B .020 to .030. Adjust at C. Fig. 2. Machine tripped for Division, Stud A should clear Arm B no more than .001. Adjust Eccentric Stud A. VERY CLOSE ADJUSTMENT IN FIG. 2.

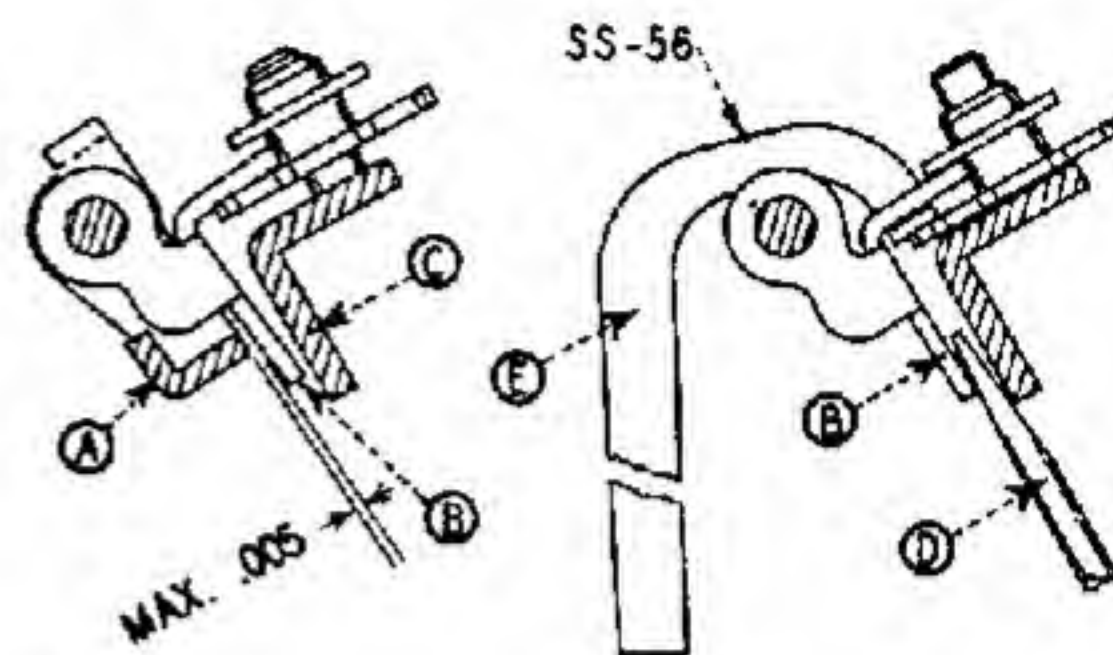


149. COMPLETE TRANSFER IDLER GEAR SECTION: There should be an equal amount of backlash or play in both Add and Subtract motions. This can be determined by turning #12 Dial slowly by Dial Wrench or, in the machine, by handcrank, and noting how the individual Dials pick up as the transfer motion progresses from the 12th Dial to the 20th Dial. If the Idler Gear Section is in too deep, there will be more backlash or play in Minus than in Plus; if the Idler Gear Section is not in deep enough, there will be more backlash or play in Plus than in Minus. Adjust as follows:

INWARD: Turn Allen Screws A and B outward, and tighten Screws C and D a like amount.

OUTWARD: Turn Screws C and D outward, and tighten Screws A and B a like amount.

CAUTION: 1/12th of a turn of the adjusting Screws may be sufficient. Keep the Idler Gear Section adjustment even. There should be an equal amount of backlash at both ends of Idler Gear Section, and it may be only necessary to adjust at one end. TIGHTEN SCREWS C AND D VERY LIGHTLY to prevent distortion of Bracket E. It is not necessary to disturb upper Bracket. Shown above are Idler Gears F and Transfer Gears G on Product Dial Shafts. This illustrates how the Gears mesh together.



150. BAIL FOR DISABLING COMPLETE TRANSFER IDLER GEAR: With Complete Transfer Blockout Bail A depressed manually, none of the Bails B should touch Bracket C and none should have more than .005 play in this position. This is to ensure equal control of the Idler Gears. To adjust, insert point of a screwdriver D, or other suitable brace, under lower tail of Bail B; and, using Forming Tool E, form upper tail of Bail B as shown at right.

CAUTION: All adjustments for Complete Transfer Mechanism are very close and must be made very carefully. It is well to eliminate all other possible causes of error before attempting adjustment of the Idler Gear Section.

b. TESTING PROCEDURE FOR COMPLETE TRANSFER

DETENT CHECK: Turn Dials slightly out of centralized position and release to see that they return to center of Detent. Failure to centralize easily may indicate that Idler Gears are being held too high by Disengaging Mechanism. Also look for binds in Sensing Fingers or in Dial Bearings.

PICK-UP CHECK: Turn Dials backward from 0 through 9 to 8 and back through 9 to 1. Do this several times. No flicker or attempt to transfer to the next Dial to the left should be seen. A movement in the next Dial to the left indicates Idler Gears are not being held high enough by Disengaging Mechanism.

PROCEED WITH TEST AS FOLLOWS

1. With Carriage in First Position, make the Detent and Pick-up Checks explained above on all Dials from #12 through #20.
2. Trip Clutch and crank machine three-quarters of a revolution (blank operation). Now, again make Pick-up Check. Dials must not show movement. Restore machine to Home Position.
3. While watching point of contact between Blockout Finger A on Add-Subtract Gate and Disengaging Arm B (see Adjustment 145), rock Add-Subtract Gate back and forth. Blocking Finger A should be very close but should not tend to hang on Disengaging Arm B.
4. Shift Carriage to 7th position. Repeat Test #3. Also Detent Check on #20 Dial.
5. Shift Carriage to last position. Turning Shift Gear by hand, position Carriage half way between last position and next-to-last position. Repeat Detent and Pick-up Checks. See Adjustment 144.
6. Try transferring Minus and Plus in all Carriage positions with 1 in first column of Main Key Board. If any Dials tend to spin or not transfer correctly, first check Carriage Adjustments and Geneva clearances and, in particular, #12 Geneva. DO NOT ATTEMPT ANY ADJUSTMENT TO IDLER GEAR SECTION UNTIL ALL OTHER ADJUSTMENTS HAVE BEEN CORRECTED.
7. Transfer 9's into Carriage and clear under

power. If trouble develops here, see Adjustments 145 and 146.

8. Transfer 9's in and out of Carriage, using Negative Multiply followed by Accumulative Multiply under power. Do this a number of times.

9. Try Division. With 1 in first column Main Key Board, shift Carriage to extreme right and divide across. If Dials to the left of the Blockout point tend to flicker or attempt to transfer, see Adjustment 148.

NOTE: The following adjustments also affect Complete Transfer. #12 Geneva should be checked for clearance to Cam on #6 Actuator. Keep adjustment close, not over .002 to .003 clearance.

Carriage Shift Rack adjustment should be kept close for a perfect mesh of Add-Subtract Gears with Product Dial Gears. A little to the right or left may affect Complete Transfer Action.

A loose Carriage affects Complete Transfer.

To test the Carriage Shift Rack adjustment, apply pressure to the Carriage, both to the right and then to the left while transferring 9's in and out of the Accumulator Dials. Do this in all Carriage Positions. If the Dials tend to falter or fail to transfer properly, the Shift Rack should be adjusted slightly in the direction indicated by this test. That is, if failure is noted when pressing the Carriage to the left, the Shift Rack should be moved slightly to the left to move the Carriage to the right.

CHAPTER 9. LUBRICATION

One of the most important functions in servicing a machine is to see that it is PROPERLY lubricated. Many machine troubles can be traced to poor lubrication. Too much and too little are both bad conditions and are to be avoided. Too much lubrication may create a condition causing sluggish action of parts actuated by springs and, in addition, serves to collect dirt and dust. Use only one drop of oil in a bearing point, as this is sufficient for proper lubrication and is all the bearing will retain. Use grease sparingly to prevent smearing adjacent parts which may become sluggish if grease is allowed to get on them.

All moving parts of the machine should have some lubrication except where adhesion is a factor. Some parts should be lubricated very sparingly or not at all, because oil may create a suction between parts that slide on flat surfaces. When this condition is found, the parts involved should be cleaned with cleaning fluid and left to dry.

OIL: A light non-gum-forming oil is recommend-

ed. There are several good oils on the market. Most of the major oil companies distribute good oils developed for lubricating small machines and instruments. Many of the so-called common household oils are not recommended, as they are not sufficiently refined to remove gums and resins.

GREASE: White petroleum jelly has been found to be very satisfactory and can be purchased in handy containers for the Service Kit.

Only the following points should be greased: Actuator and Drive Shaft Gears (oil the bearings); Division Control Cams; Centralizer (a MUST); Sensing Finger Cam; Drive Pinion Gear (sparingly); Counter Oscillator Cam; Rocker Cam and Stud. You may find a few other points where grease has been used in the manufacture of the machine, but after the initial operating period of the machine, oil will serve as well or better for lubrication.

The following Field Test should be made wholly or in part on every Service Inspection of customer machines to ensure the accuracy of the machine. This test will also show up mechanical defects which lead to service calls as well as errors, which lead to customer dissatisfaction. The most important thing to remember when inspecting a machine is: IT MUST PRODUCE ACCURATE FIGURES. Secondly, it must run well and look well.

This Field Test is primarily designed for the Model STW but can be used on all Friden Models by varying the procedure and eliminating portions which do not apply to such Models as C, CW, DW, etc.

CONTROL KEYS

Before starting this test, make note of the position of all Control Keys on the machine. For example, if you find the #6 Tabulator Stop depressed, be sure it is still depressed when you leave the machine. This also applies to the Add Key, Counter Control Key, Multiplier Non Entry Key, Multiplier Repeat Key, Dial Lock Knobs and Division Stop Key.

Check all Keys: Numeral Keys, Operating Keys, Control Keys, Decimal Markers, etc., for free action. Spin Accumulator Dials by using the Twirler Knobs to see that they are free and there are no stuck Detent Balls. Check Motor Contact with Plus Bar. Check Individual Column Key Locks.

ACCURACY OPERATING TEST

Selection and One Cycle Add Test. With Add Key down, check to see that all keys release with Plus and Minus Bars.

KEYBOARD	TOUCH RETURN CLEAR	UPPER DIALS	LOWER DIALS
9999999999	Plus Bar	9999999999	1
8888888888	" "	1888888888	2
7777777777	" "	2666666666	3
6666666666	" "	3333333330	4
5555555555	" "	3888888885	5
4444444444	" "	4333333329	6
3333333333	" "	4666666662	7
2222222222	" "	4888888884	8
1111111111	" "	4999999995	9
1111111111	Minus Bar	4888888884	8
2222222222	" "	4666666662	7
3333333333	" "	4333333329	6
4444444444	" "	3888888885	5
5555555555	" "	3333333330	4
6666666666	" "	2666666664	3
7777777777	" "	1888888887	2
8888888888	" "	9999999999	1
9999999999	" "	0000000000	0

UPPER DIALS AND LOWER DIALS SHOULD READ ALL ZEROS

Note: Hold Plus Bar and Minus Bar down for an instant after each operation. Machine should not make more than one revolution.

COUNTER DIALS AND COUNTER

Make Multiplication Test below by using Plus and Minus Bars:

Check Lower Dials closely to see that each Lower Dial registers correctly on each stroke. Plus 10X means Plus 10 individual strokes on the Plus Bar. Plus or Minus 9X means Plus or Minus 9 times.

Do not hold the Plus or Minus Bars down, but make separate strokes.

ADD KEY UP		SET ON KEYBOARD 1123454321	
CARRIAGE POSITION	TOUCH RETURN CLEAR	UPPER DIALS	LOWER DIALS
1	Plus 10X	11234543210	10
2	" 9X	112345432100	100
3	" 9X	1123454321000	1000
4	" 9X	11234543210000	10000
5	" 9X	112345432100000	100000
6	" 9X	1123454321000000	1000000
7	" 9X	11234543210000000	10000000
8	" 9X	112345432100000000	100000000
9	" 9X	1123454321000000000	1000000000
10	" 9X	11234543210000000000	10000000000
10	Minus 9X	11234543210000000000	1000000000
9	" 9X	11234543210000000000	1000000000
8	" 9X	11234543210000000000	1000000000
7	" 9X	11234543210000000000	1000000000
6	" 9X	11234543210000000000	1000000000
5	" 9X	11234543210000000000	1000000000
4	" 9X	11234543210000000000	1000000000
3	" 9X	11234543210000000000	1000000000
2	" 9X	11234543210000000000	1000000000
1	" 10X	0000000000	00

FRIDEN CALCULATING MACHINE CO., INC.
FIELD TESTS AND INSPECTION PROCEDURE

8-15-50

AUTOMATIC SHIFT

Work any 10 digits in Keyboard by 10 digit Multiplier, and check for proper Automatic Carriage Shift. Work any 20 digits by 10 digits in Division and check for proper Automatic Carriage Shift, both to the right and left.

EXTRA CARRYOVER AND BELL TEST

Repeat each operation several times in each Carriage position. Listen for the Bell to ring on both Minus and Plus operations. Note if Bell fails to ring in any Carriage position, up to and including the 7th position on 10-Bank machines, and 6th position on 8-Bank machines.

ADD KEY UP

KEYBOARD I Locked in			
CARRIAGE POSITION	TOUCH RETURN CLEAR	UPPER DIALS	LOWER DIALS
1	Minus Plus	99999999999999 All Zeros	9999999999 All Zeros
2	Minus Plus	99999999999990 All Zeros	9999999990 All Zeros
3	Minus Plus	99999999999900 All Zeros	9999999900 All Zeros
4	Minus Plus	999999999999000 All Zeros	99999999000 All Zeros
5	Minus Plus	9999999999990000 All Zeros	999999990000 All Zeros
6	Minus Plus	99999999999900000 All Zeros	9999999900000 All Zeros
7	Minus Plus	999999999999000000 All Zeros	99999999000000 All Zeros

**DIVIDEND TAB. DIVISION AND
DIVISION ALIGNER**

Work the following problems, and check action of Dividend Tabulator, proper entry and Division results. Also see that the Division Aligner works properly by shifting Carriage back to position #1 after each Dividend Tabulator operation and before Dividing.

DEPRESS TABULATOR KEY #9

KEYBOARD	TOUCH	UPPER DIALS	LOWER DIALS
8888888888 9999999999	Div. Tab. Left Shift Both Div.	8888888888000000000 8888888888	8888888888
7777777777 9999999999	Div. Tab. Left Shift Both Div.	7777777777000000000 7777777777	7777777777
6666666666 9999999999	Div. Tab. Left Shift Both Div.	6666666666000000000 6666666666	6666666666
5555555555 9999999999	Div. Tab. Left Shift Both Div.	5555555555000000000 5555555555	5555555555
4444444444 9999999999	Div. Tab. Left Shift Both Div.	4444444444000000000 4444444444	4444444444
3333333333 9999999999	Div. Tab. Left Shift Both Div.	3333333333000000000 3333333333	3333333333
2222222222 9999999999	Div. Tab. Left Shift Both Div.	2222222222000000000 2222222222	2222222222
1111111111 9999999999	Div. Tab. Left Shift Both Div.	1111111111000000000 1111111111	1111111111

**RETURN CLEAR AND
POWER ACTUATED SHIFT**

Check for proper operation of Return Clear Key, and note that Carriage begins to shift on the second cycle of the machine. If the Carriage hesitates at the start or skips a shift now and then, this denotes that the Power Shift Actuating Mechanism is not latching or functioning properly.

**MULTIPLICATION TEST USING
REPEAT MULTIPLIER**

Work the following Multiplication problems:

ADD KEY UP
SET 111111111 ON KEYBOARD. LOCK

MULTIPLIER KEYBOARD	TOUCH	UPPER DIALS	LOWER DIALS
1212121212	Rep. Mult. Mult. Key Neg. Mult. Mult. Corr.	1346801346531986532 All Zeros	1212121212 All Zeros
2323232323	Rep. Mult. Accum. Mult. Neg. Mult. Mult. Corr.	2581369247519640852 All Zeros	2323232323 All Zeros
3434343434	Rep. Mult. Mult. Key Neg. Mult. Mult. Corr.	3815937148507295174 All Zeros	3434343434 All Zeros
4545454545	Rep. Mult. Accum. Mult. Neg. Mult. Mult. Corr.	50505050494949495 All Zeros	4545454545 All Zeros
5656565656	Rep. Mult. Mult. Key Neg. Mult. Mult. Corr.	6285072950482603816 All Zeros	5656565656 All Zeros
6767676767	Rep. Mult. Accum. Mult. Neg. Mult. Mult. Corr.	7519640851470258137 All Zeros	6767676767 All Zeros
7878787878	Rep. Mult. Mult. Key Neg. Mult. Mult. Corr.	8754208752457912458 All Zeros	7878787878 All Zeros
8989898989	Rep. Mult. Accum. Mult. Neg. Mult. Mult. Corr.	9988776653445566779 All Zeros	8989898989 All Zeros

**CARRIAGE CLEAR RACKS AND
SPLIT & NORMAL CLEARANCE**

Try the Optional Clear and Split Clear Knobs in both positions; and check for freeness, proper Detent action, rubbing on cover, etc. Manually clear the Dials; check for proper clearing action.

CARRIAGE SHIFT

Using Shift Keys, make sure that Carriage shifts freely into position, both from left to right and from right to left. Make sure Shift Keys do not bind, rub on cover, etc.

MECHANICAL INSPECTION

After giving the machine a thorough operating test, make a thorough inspection for evidences of wear and other conditions which may cause trouble in the future. Make corrections of any failures discovered. DO NOT change any adjustment without good cause.

Next, do what cleaning is necessary and lubricate all bearings and bearing surfaces, being careful not to use too much oil. On a well-serviced machine, it is not necessary to lubricate all points at every inspection; this can be determined by inspection. The motor needs very little oil, only one drop of light oil in each oil cup every six to eight months. The motor is equipped with LEDALOYL Bearings. These bearings are porous and retain oil for a long period of time and, for this reason, the oil hole is not drilled through the bearing. Excess oil on the motor bearings tends to foul the Governor and Commutator Brushes and is one cause of sticking brushes.

Clean Covers, Key Tops and Dials thoroughly. Leave the machine not only working efficiently but looking in first-class condition. This is a mark of good workmanship and is the principal item of Maintenance Service, which impresses the customer. The inside of the machine he cannot see; therefore he must judge your proficiency as a service man by what he can see on the outside. This also increases the "Silent Salesman" value of the machines in your territory.

Clean the desk or working space used while making the inspection. This is a very important rule of etiquette for the Friden Service Man to follow. Take particular care to protect desks, tables or other working space used while making inspections or repairs. The customer appreciates these attentions which increase your reputation for good, efficient FRIDEN SERVICE.

Fill out a Service Report upon completion of an inspection or repair service, noting corrections made, if any, and any other pertinent information which may be useful for invoicing and machine record. Make a separate Service Report for each machine worked on, have some person in authority sign the Service Report for the customer and then sign them yourself. Make sufficient copies of the Service Report so one copy may be left with the customer and copies retained for the office and service file. Service Reports are an important record for reference in case of a question arising regarding service on a machine. Get the habit!

WAIT!! Did you leave the Machine Control Keys as you found them? Check this detail with the operator of the machine.

FRIDEN SERVICE doesn't COST the customer anything compared to the DIVIDENDS it PAYS

NOTE: Numbers listed after certain items in this Check List refer to adjustments related to that item.

**a. ERRORS IN ADDITION
AND SUBTRACTION**

1. CONDITION OF PARTS:

- a. Worn or damaged Transfer Lever
- b. Worn Transfer Cam on Accumulator Dial
- c. Broken, worn or damaged Transfer Gear
- d. Worn, loose or damaged Accumulator Dial Gear
- e. Transfer Lever missing Transfer Cam
- f. Worn Transfer Lever bearings in Carriage Frame
- g. Stuck Detent Ball in Accumulator Dial, Add-Subtract Gear Shaft or Transfer Pin
- h. Spring missing or broken in Detent
- i. Worn or damaged Add-Subtract Gear
- j. Spring Transfer failing
- k. Loose Pins in Add-Subtract Gate Shaft
- l. Worn Hub 6081 on Gate Control Lever
- m. Worn or damaged Geneva or Geneva Disc on Actuator
- n. Worn or damaged Selecting Gear
- o. Worn or damaged Cycle Lock Pin
- p. Backlash in Actuators
- q. Key Board Clear Mechanism, 36

2. CARRIAGE ADJUSTMENTS:

- a. Carriage too loose or too tight, 56
- b. Adjustment of Transfer Levers to Transfer Gears, 56
- c. Carriage Shift Rack loose or out of adjustment, 57
- d. Transfer Lever alignment, 55

3. ADD-SUBTRACT GATE CONTROL ADJUSTMENTS:

- a. Add-Subtract Gate Centralizer, 60
- b. Plus-Minus Keys to Gate, 61
- c. Add-Subtract Gate Stops, 63, 89, 121
- d. Cycle Lock Pin, 54
- e. Extra Transfer, 58, 59, 65
- f. Geneva setting, 19
- g. Loose Screws or Studs

NOTE: ALWAYS check these points first when errors occur, regardless of the operation in which errors are noted.

b. ERRORS IN COUNTER

1. CONDITION OF PARTS:

- a. Worn or bent Counter Primary Tooth
- b. Bent Counter Secondary Tooth
- c. Blockout Lever on #1 Counter Tooth out of line
- d. Counter Blocking Slide worn or out of adjustment
- e. Secondary Lug cutting into Primary Tooth
- f. Loose Screws or Studs
- g. Worn or damaged Oscillator Arm, 62
- h. Worn or damaged Oscillator Cam, 62

2. ADJUSTMENTS:

- a. Adjustment to right or left for full throw, 90
- b. Adjustment of Rocker Lever for proper clearances, 88
- c. Spiral alignment of Secondary Teeth, F, 93, 94
- d. Counter Blocking Slide adjustment, 89
- e. Multiplier Non-Entry adjustment, 91

3. FAILS TO COUNT:

- a. Dividend Tabulator Counter Blocking Slide binding, 101
- b. Adjustment off on right and left for full throw, 90
- c. #1 Counter Primary Tooth bent, 93
- d. Multiplier Non-Entry engaged or binding, 91

4. FAILS TO TRANSFER:

- a. Secondary Counter Tooth bent, 93
- b. Secondary Counter Tooth hitting bottom of Notch in Cam, 94
- c. Spring off or parts binding
- d. Primary Counter Tooth bent, 93

5. SECONDARY PICK-UP: (False Transfer):

- a. Spiral alignment of Secondary Teeth out of adjustment, 94
- b. No thrust Spring in Counter Dial, Counter Dial dropping down in the way of Secondary Tooth
- c. Worn or loose Counter Blockout Cam

6. COUNTER PICKS UP WHILE CARRIAGE IS SHIFTING:

- a. Counter adjusted too far forward, 88
- b. Counter Blocking Slide worn or out of adjustment, 89
- c. Blocking Lever on #1 Counter Tooth bent, 89

c. DIVISION ALIGNER

1. CONDITION OF PARTS:

- a. Inside Division Latch not holding, check spring
- b. Worn or damaged Latches on Shift Actuator, 80, 81, 82
- c. Sensing Lever or Cam on Throwout Shaft worn, 78
- d. Sensing Fingers worn or sticking, 84

2. ADJUSTMENTS:

- a. Shift Actuator adjustment and alignment to Shift Controllers 80, 81
- b. Latches for restoring in Home Position, 82

DIVISION ALIGNER (Adjustments continued)

- c. Latch Bails, 83,84
- d. Sensing Lever, 85
- e. Sensing Fingers, 85
- f. Last-order delatching Levers, 87
- g. Division Throwout Actuator Slide, 86

d. DIVISION

1. CONDITION OF PARTS:

- a. FIRST check conditions listed for errors in addition and subtraction - A MUST - See page 48
- b. Worn Add-Subtract Gate Control Stud C, Adjustment 72
- c. Shift Centralizer worn or without lubrication, 73
- d. Loose Taper Pins in Division Control Gear Assembly
- e. Worn Stop Pin D in Control Plate, Adjustment 68
- f. Broken parts

2. ADJUSTMENTS:

- a. FIRST check Basic Adjustments for addition and subtraction. See page 48
- b. Add-Subtract Gate Control Stud C, Adjustment 72
- c. Division Shift Centralizer, 73
- d. Add-Subtract Gate Bumper on Rear Bearing Plate, 63
- e. Clutch Latch, 74
- f. Control Arm Stop, 71
- g. Connector Arm on Long Transfer Pin, 70
- h. Throw of Shift Throwout Actuator for Division Control Gear, 68
- i. Timing of Throwout Cam on #6 Actuator, 69
- j. Clearance of Throwout Actuator to Roller on #6 Actuator, 69
- k. Adjustments of Division Aligner, 80 to 87 inclusive

NOTE: A good plan of attack on a Division Problem is to break it down into its various operations. Is the trouble occurring in

- a. Subtract Cycle?
- b. Add Cycle?
- c. Shift Cycle?
- d. Aligner in first Carriage Position?
- e. Aligner, Subtract Cycle?
- f. Aligner, Add Cycle?
- g. Aligner, Shift Cycle?
- h. Aligner, going past delatching position?
- i. Aligner, last Carriage Position?
- j. Aligner, failing to shift at all?
- k. Binding parts and Assemblies?
- l. Lubrication?

These checking points should prove valuable in accurately locating the exact point where trouble is occurring and, therefore, make the correction of the trouble much easier.

e. CARRIAGE CLEAR

1. FAILS TO SHIFT CARRIAGE TO LEFT:

- a. Power Shift Actuating Mechanism failing to latch, 24
- b. Shift Clutch not engaging properly, 22
- c. Binding parts
- d. Main Clutch not releasing properly
- e. Lubrication

2. FAILS TO CLEAR DIALS:

- a. Clear Clutch not engaging properly, 23
- b. Clear Slide binding, 42,43,45
- c. Clear Pawl out of adjustment, 46
- d. Dial Locks turned to Locked Position, 42
- e. Broken Clear Gear on Dial Shaft
- f. Cocked Accumulator or Counter Dial

f. DIVIDEND TABULATOR
CROSS TABULATOR

1. FAILS TO SHIFT CARRIAGE TO LEFT OR TO CLEAR DIALS:

Same check as for Carriage Clear. See above page 49

2. FAILS TO SHIFT CARRIAGE TO RIGHT OUT OF FIRST POSITION:

- a. Shift set-up Lever failing to latch, too little or too much overlatch, 96
- b. Spring off Shift Set-up Levers
- c. Loose Carriage, Shift Rack or Shift Rack Bracket, 56,57
- d. Shift Disabling Slide binding or out of adjustment, 125
- e. Shift Latch Control Lever C binding, Adjustment 95
- f. Lubrication of Latch and other parts
- g. Slip Clutch Screws backed out and hitting Latch

3. SHIFTS CARRIAGE ONE OR MORE SPACES TO RIGHT AND QUILTS:

- a. Slip Clutch Screws backed out and knocking Latch off
- b. Left Shift Clutch failing to release, 125
- c. Weak Springs
- d. Latch worn and failing to hold, 96
- e. Lubrication

4. CARRIAGE SHIFTS TO STOP. NO DIVIDEND ENTRY; CONTINUES TO RUN:

- a. Gate Setting Lever not being tripped
- b. Too much clearance between A and B, see Adjustment 97
- c. Too much clearance between A and B, see Adjustment 98

- d. Not enough clearance between A and B, see Adjustment 97
 - e. Not enough clearance between A and B, see Adjustment 98
 - f. Right Shift Gear out of time, 10
 - g. Too much overlatch of C on D, see Adjustment 99
5. CARRIAGE SHIFTS TO STOP, NO ENTRY, MACHINE STOPS:
- a. Key Board Locked
 - b. No numbers in Key Board
 - c. Key Board clearing prematurely, 36
 - d. Carriage fails to centralize properly, 95
 - e. Add-Subtract Gate binding
6. CARRIAGE SHIFTS TO STOP, ONLY PARTIAL ENTRY OF DIVIDEND:
- a. Roller C too close or too wide to Lever D, see Adjustment 100
 - b. Binding Relatch Lever Link, 99
 - c. Add-Subtract Gate binding
 - d. Carriage fails to centralize properly, 95
 - e. Weak Spring
 - f. Lubrication
 - g. Multiplier Keys Release Mechanism interfering, 143
7. DIVIDEND ENTERS MORE THAN ONE TIME:
- a. Lever C not relatching
 - b. Insufficient overlatch of C on D, see Adjustment 99
 - c. Lever B binding or caught on Trip Lever A, see Adjustment 98
 - d. Worn or loose Roller on Division Drive Gear, 77, 99
 - e. Lubrication
8. CARRIAGE SHIFTS THROUGH TABULATOR STOP:
- a. No Stop depressed.
 - b. Lever A loose or very wide to Slide B, see Adjustment 97
 - c. Shift Clutch failing to release, 95, 97
 - d. Shift Set-up Lever failing to delatch, 95, 97
 - e. Carriage loose, 56, Step 2
9. DIVIDEND ENTERS, KEY REMAINS LATCHED MACHINE CONTINUES TO RUN:
- a. Key not being delatched by upper end of Lever A, see Adjustment 100
 - b. Keystem binding
 - c. Key being held down by operator
10. TABULATOR KEY FAILS TO LATCH OR STAY LATCHED:
- a. Worn Latch point
 - b. Not enough bite on Latch
 - c. Spring weak or off
 - d. Latch binding
 - e. Lubrication

g. MULTIPLICATION

1. FAILS TO SHIFT CARRIAGE TO LEFT OR CLEAR DIALS:
Same as for Carriage Clear. See page 49
2. FAILS TO MULTIPLY IN FIRST CARRIAGE POSITION:
- a. Check adjustment of add-Subtract Gate Centralizer, see Adjustment 60
 - b. Binds in Add-Subtract Gate operating Levers, 116
 - c. Add-Subtract Gate Control adjustments for multiply, 113 to 125 inclusive
 - d. Weak or detached Springs
 - e. Loose Taper Pins
 - f. Lubrication
3. CARRIAGE FAILS TO SHIFT TO RIGHT:
- a. Carriage Shift Shaft Assembly adjustments, 126 to 130 inclusive
 - b. Weak Springs
 - c. Adjustment of Add-Subtract Gate Stabilizer, 128
 - d. Binds in Carriage Shift Shaft Assembly
 - e. Add-Subtract Gate binding
 - f. Timing of Right Shift Gear, 10
 - g. Carriage failing to centralize properly
4. CARRIAGE SHIFTS OUT OF TURN:
- a. Too little or too much overlatch of Lever C on Latch D, see Adjustment 126
 - b. Worn or loose Roller on Power Set Cam, 11, 126
 - c. Loose Taper Pins or loose Hubs on Shift Shaft Assembly
 - d. Shift Clutch binding
 - e. Power Set Disabling Lever binding, 118
 - f. Lubrication
5. ERRORS, UNDER MULTIPLICATION:
(CHECK BASIC ADJUSTMENTS, see page 48):
- a. Check Feed Pawl for being disabled when Unit shifts; it may be picking up a number in the Shift
 - b. Check Cycle Lock Pin for wear or adjustment, 54
 - c. Adjustments for Add-Subtract Gate Control, 113 to 125 inclusive
 - d. Check Multiplier Selection, sticky Setting Levers, etc., 107
 - e. Check Counter; Upper Dials may be correct, 88 to 94 inclusive
6. ERRORS, OVER MULTIPLICATION:
(CHECK BASIC ADJUSTMENTS, see page 48):
- a. Check Feed Pawl for proper count, 110
 - b. Holding Pawl for proper latching on Segment, 110
 - c. Binds in Feed Pawl or Holding Pawl, 110
 - d. Multiplier Unit Shift adjustments, 111

- e. Check Segment for restoring on Zero Latch
- f. Check Selection adjustments, 104 to 109 inclusive
- g. Broken Pin in Pin Board, 107
- h. Broken or weak Detent Spring in Pin Board, 107
- i. False Transfer due to Transfer Pin failing to restore

7. ERRORS, NEGATIVE MULTIPLICATION:

- a. Check Minus Gate Stops; Gate may be hitting Transfer Gears and causing a false Transfer, 63, 89, 121
- b. Cycle Lock Pin worn or out of adjustment, 54
- c. Add-Subtract Gate Control Levers. Plus Lever may be interfering, 116
- d. Counter Adjustments. Upper Dials may be correct, 88 to 94 inclusive

8. ERRORS, REPEAT MULTIPLICATION:

- a. Check adjustment of Repeat Lock, 134
- b. Adjustment of Repeat Lock Latch, 135
- c. Adjustment of Segment Ring Lock, 137
- d. Springs
- e. Binding parts
- f. Other checks for Multiplication Errors

9. ERRORS, UPPER DIALS ONLY:

- a. Check Basic Adjustments for addition and subtraction, see page 48
- b. Add - Subtract Gate Control Levers for multiplication, 113 to 125 inclusive
- c. Cycle Lock Pin, 54
- d. Carriage Shift timing, 10
- e. Carriage failing to centralize properly, 128
- f. Carriage Adjustment, too tight or too loose, 56

10. ERRORS, COUNTER ONLY:

- a. Check all Counter Adjustments, 88 to 94 inclusive
- b. Carriage Shift may be oscillating or not centralizing
- c. Counter Blocking Slide Adjustment, 89
- d. Dividend Tabulator Counter Blocking Slide binding, 101
- e. Multiplier Non-Entry Adjustment, 91
- f. Counter Oscillator Arm, loose Studs or worn Cam, 62
- g. Carriage Shift Rack out of adjustment, 57

11. MULTIPLIER CLEAR, LOCK-UPS AND FAILURE TO CLEAR OUT SEGMENTS:

- a. Lock-up clearing out Repeat; check Lock and Latch adjustments, 134, 135
- b. Spring 1131
- c. Adjustment of Repeat Latch Release Bail, 135
- d. Adjustment of Unit Shift Rack, 111
- e. Timing of Unit Shift Shaft, 12
- f. Timing of Reset Cam, 13
- g. Zero Latches binding or failing to latch, broken spring
- h. Taper Pins, Screws, Springs, etc., loose or distorted

12. ERRORS, MULTIPLIER SELECTION:

- a. For a 9 error, check Zero Latches and Multiplier Clear
- b. For underselection, check Setting Levers for sticking, 107
- c. Check Setting Pins for proper positioning before Segment Releases, 108
- d. Check adjustment of Zero Release Lever, 108
- e. Broken Pin, 107
- f. Weak or broken Detent Spring, 107
- g. Adjustment of Escapement Bracket, 104

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 anything compared to the DIVIDENDS it PAYS

PARTS GUIDE

Parts numbers and names in the Parts List in the back of this Manual are arranged in numerical order for your convenience.

Complete Assemblies are underscored thus, 41550 and will consist of all parts indented and listed below. Parts numbers ending in 5 or 0 denote Sub-Assemblies and will consist of two or more parts or a part and a stud riveted together, except in the case of parts numbered from 1000 to 7000 inclusive.

The letter T after a part number denotes the part is used on 10 Bank machines and is a part of the number.

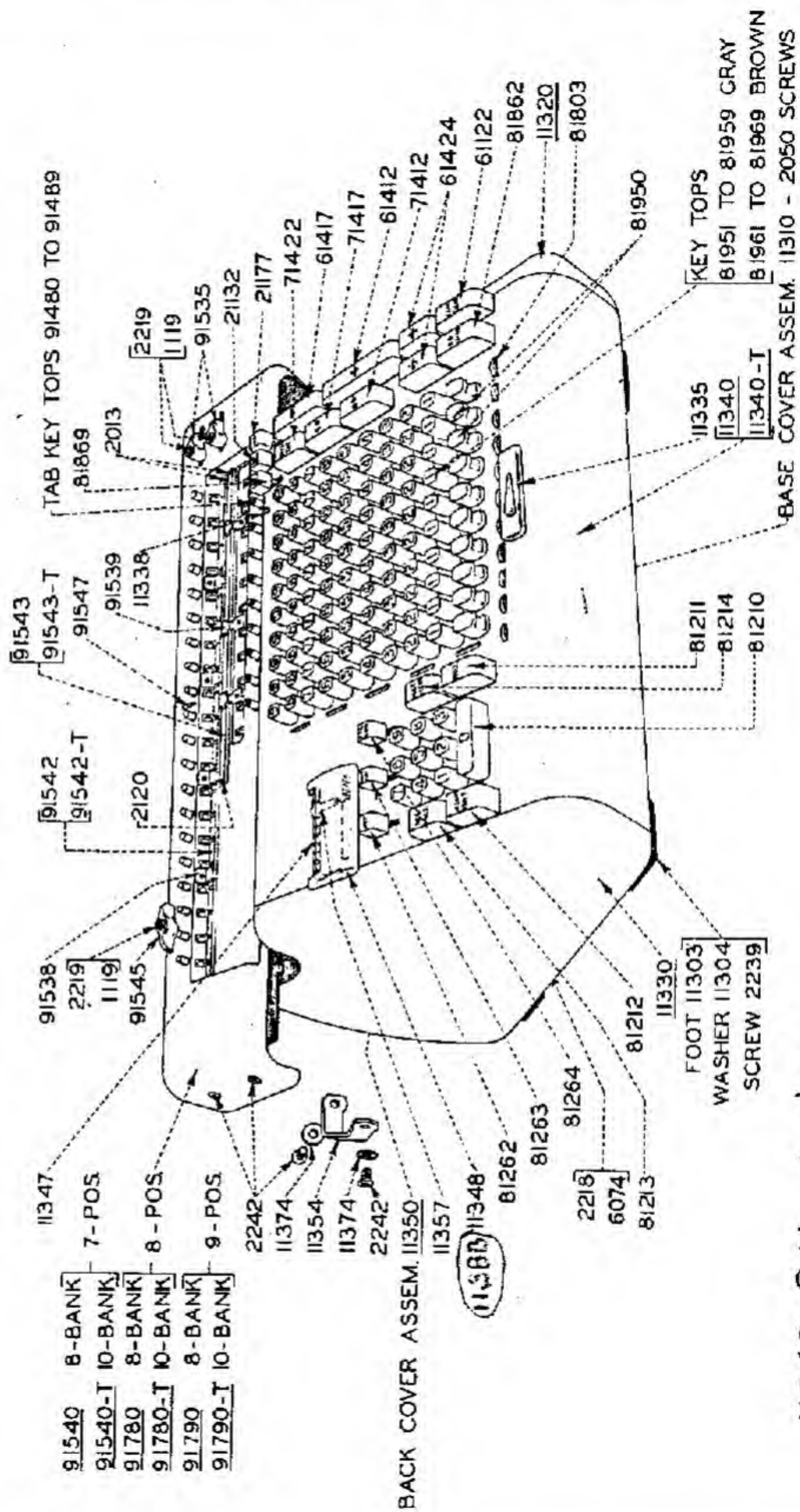
Order parts carefully, using the proper part number and name to insure receiving the correct parts. To further insure promptness and accuracy in filling your parts orders, it is advisable to put the machine Serial Number on your order, especially when ordering special parts.

The asterisk * preceding page numbers in the Parts List denotes the part is shown on other pages as well as the one listed.

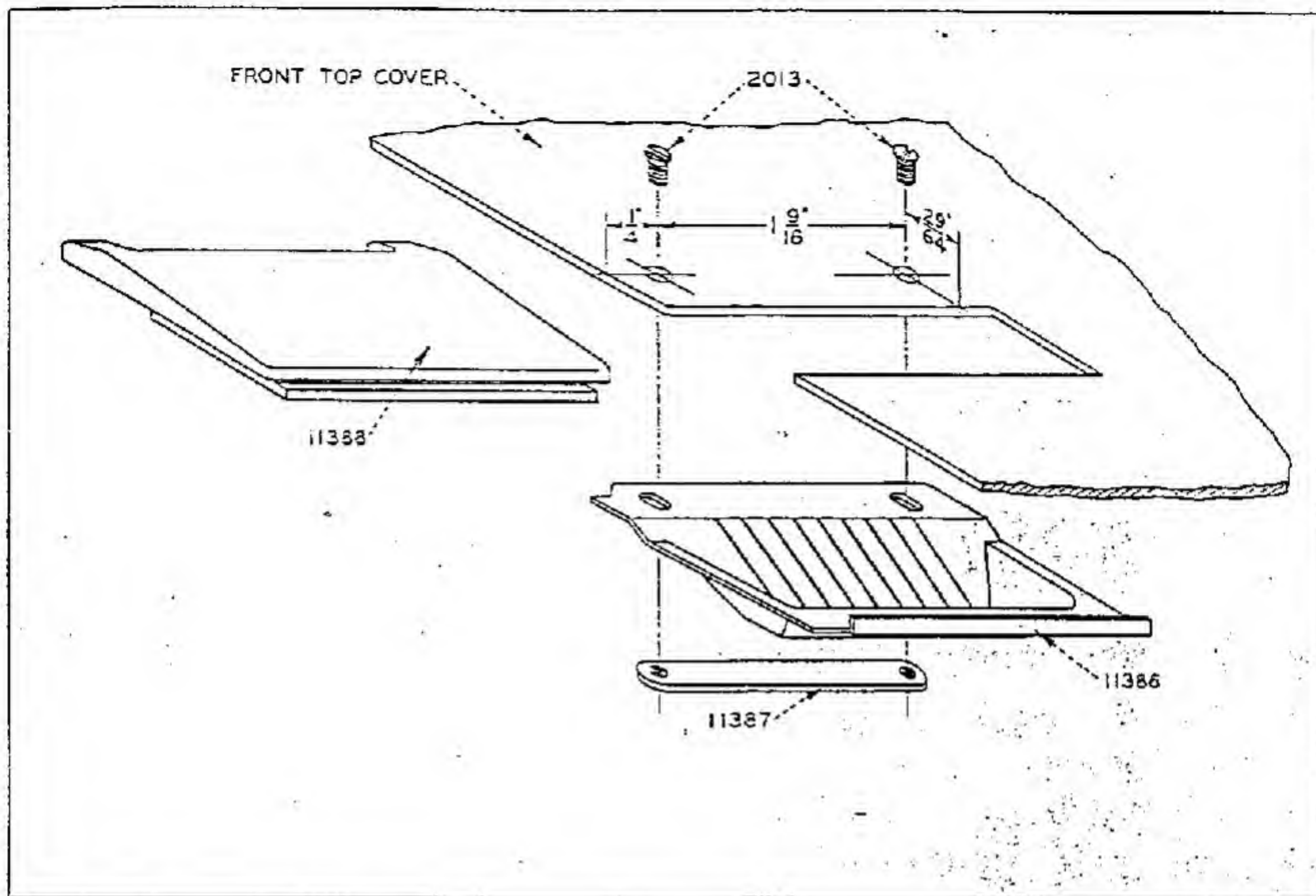
The following Code of Parts Numbers is given as an aid to you in identifying and locating parts in the Parts Drawings. The numbering of all parts in the machine generally follows this Code of Numbers; thus, a Carriage Part would be found in the 90000 Group, a Screw in the 2000 Group, etc.

1000. . . .	Springs	
2000. . . .	Screws	
3000. . . .	Nuts	
4000. . . .	Washers, Clips, Spacers, Rollers, Shims	
5000. . . .	Studs	
6000. . . .	Bushings	See
7000. . . .	Taper Pins, Dowel Pins Rivets, etc.	Page
10000. . . .	Base, Motor, Covers	87
20000. . . .	Right Side Frame	87
30000. . . .	Left Side Frame, Bearing Plates	88
40000. . . .	Division, Counter	89
50000. . . .	Drive, Actuators	91
60000. . . .	Control Plate	92
70000. . . .	Carriage Shift	93
80000. . . .	Key Board, Selection	95
90000. . . .	Carriage	97

EXTENSION CORD - 10040
FELT PAD - 11022
DUST COVER - 11017



11349 Rubber beading

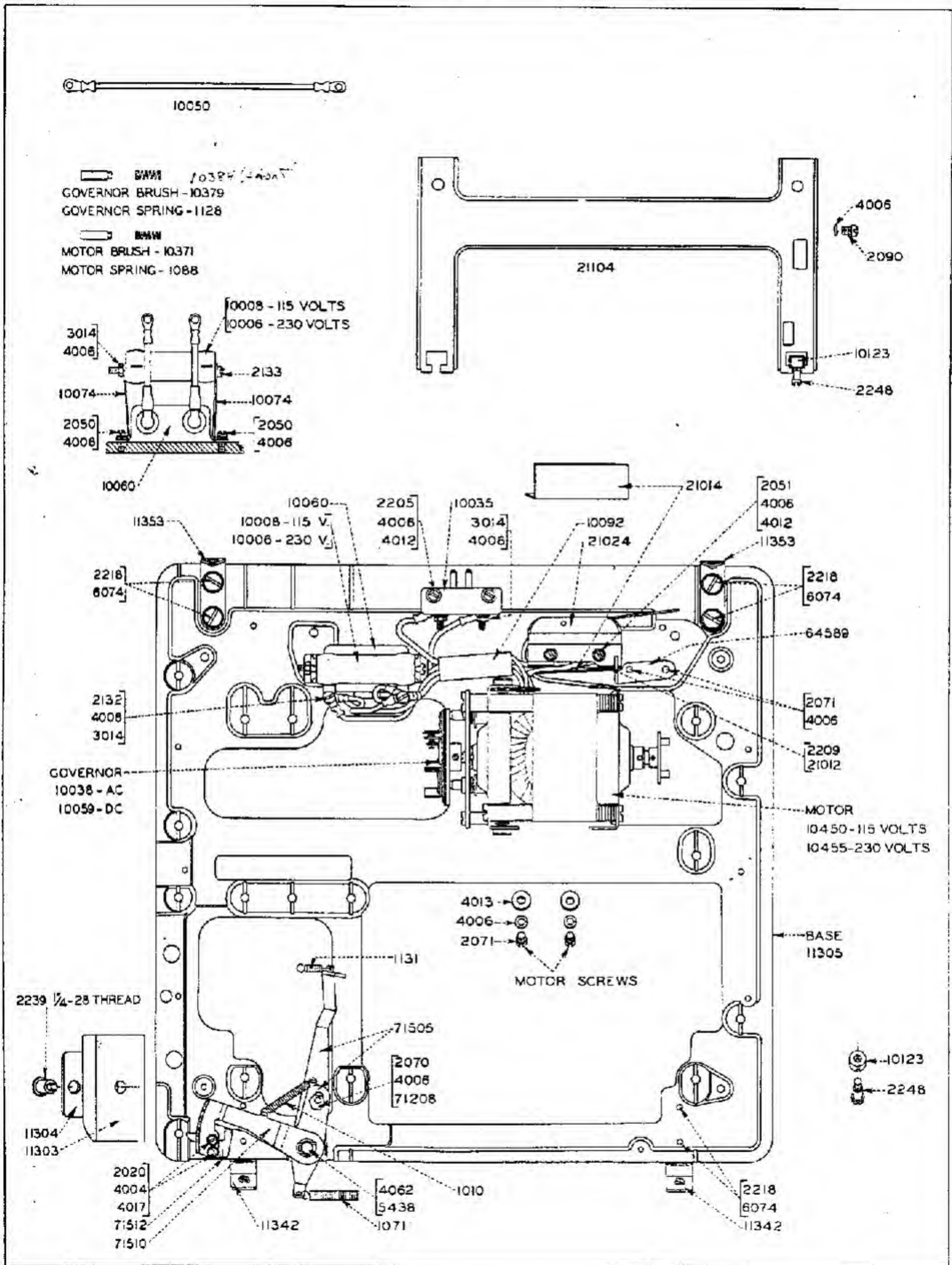


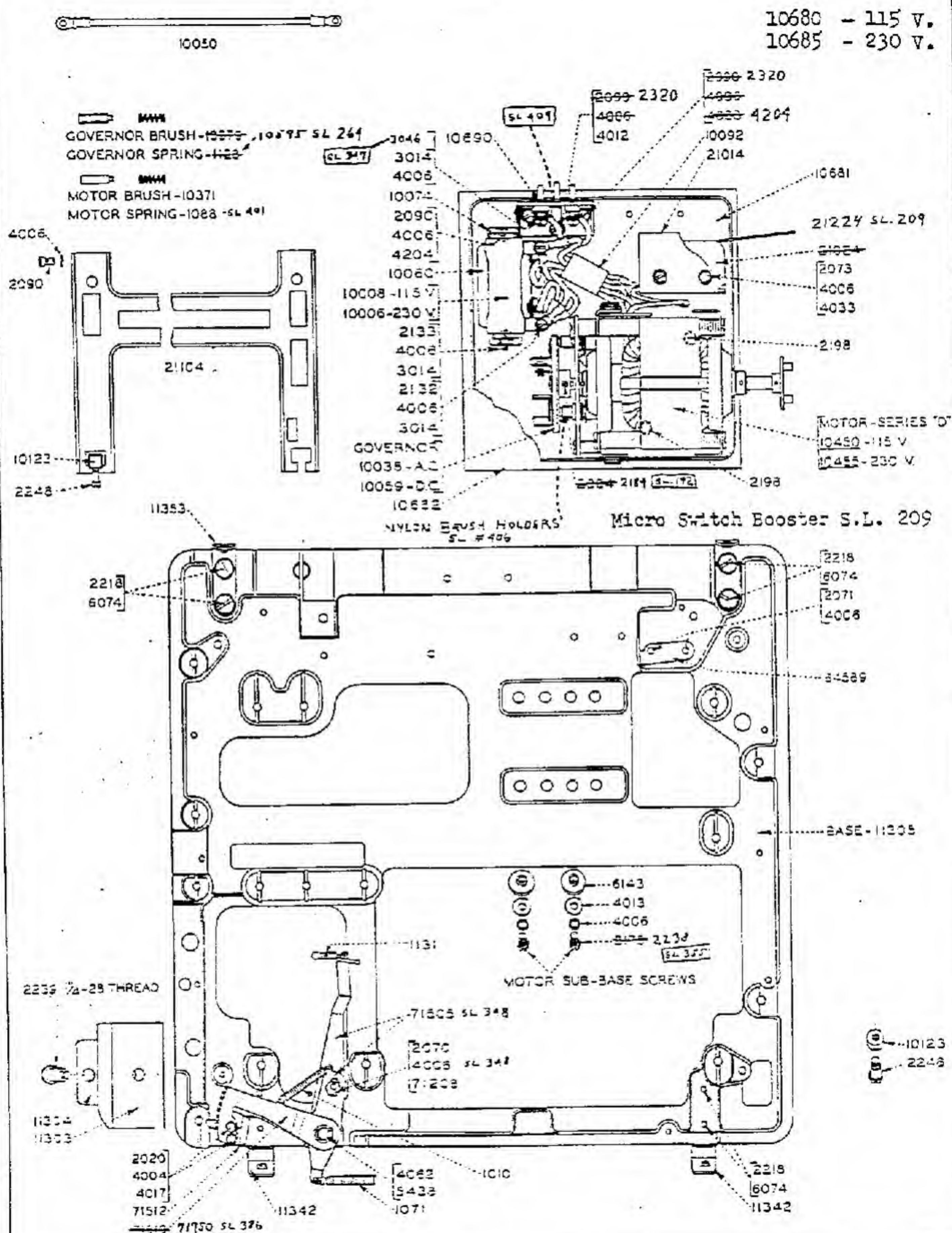
PARTS LIST AND INSTRUCTIONS

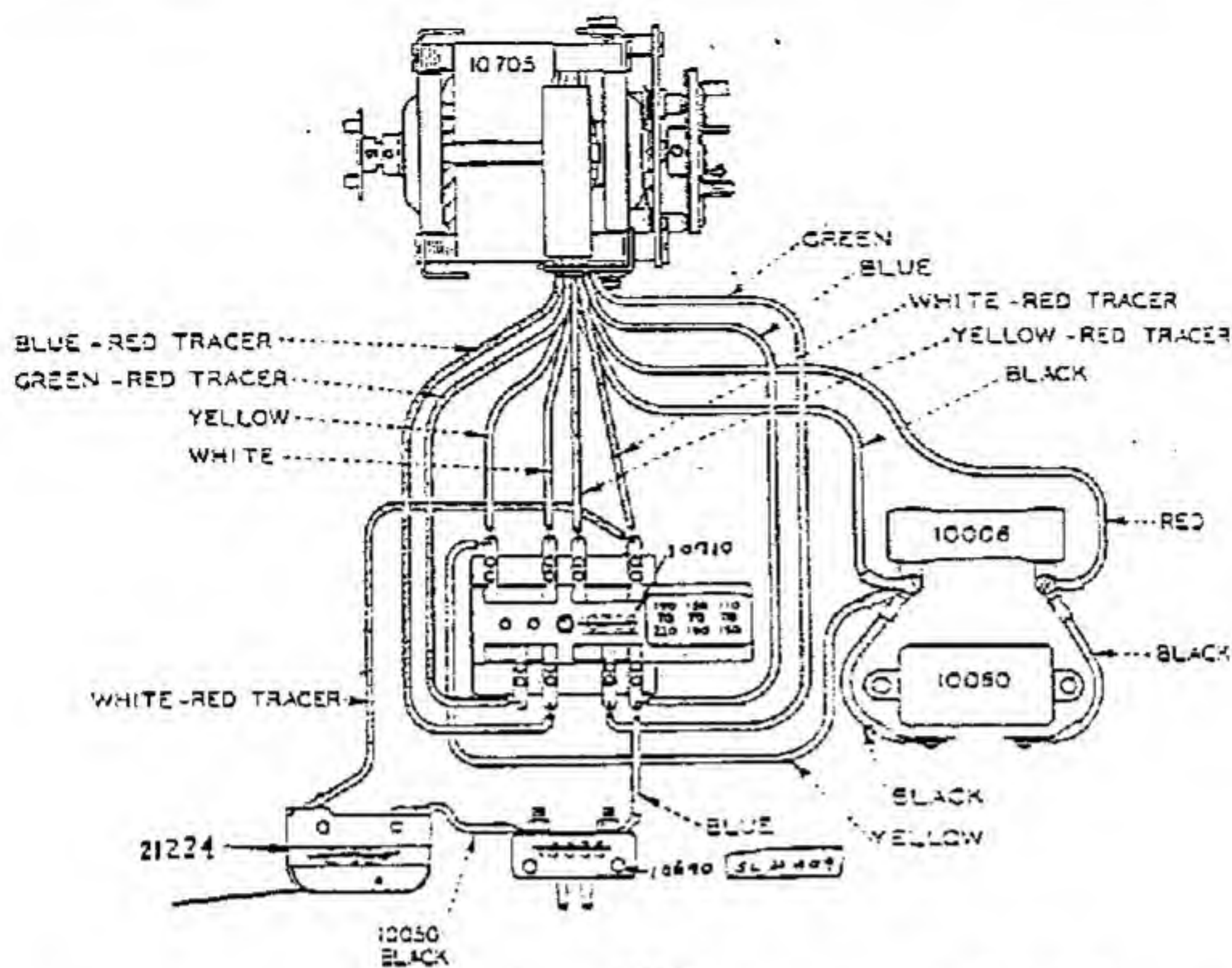
2013	2-56 Special Flat Head Screw	11387	Retainer for Multiplier Dials Mask
11386	Mask for Multiplier Check Dials	11388	Window for Multiplier Check Dials

The above parts replace Window for Multiplier Check Dials #11348 which is no longer available for replacement. The Mask for Multiplier Check Dials #11386 is adjustable for aligning with Dial Numerals.

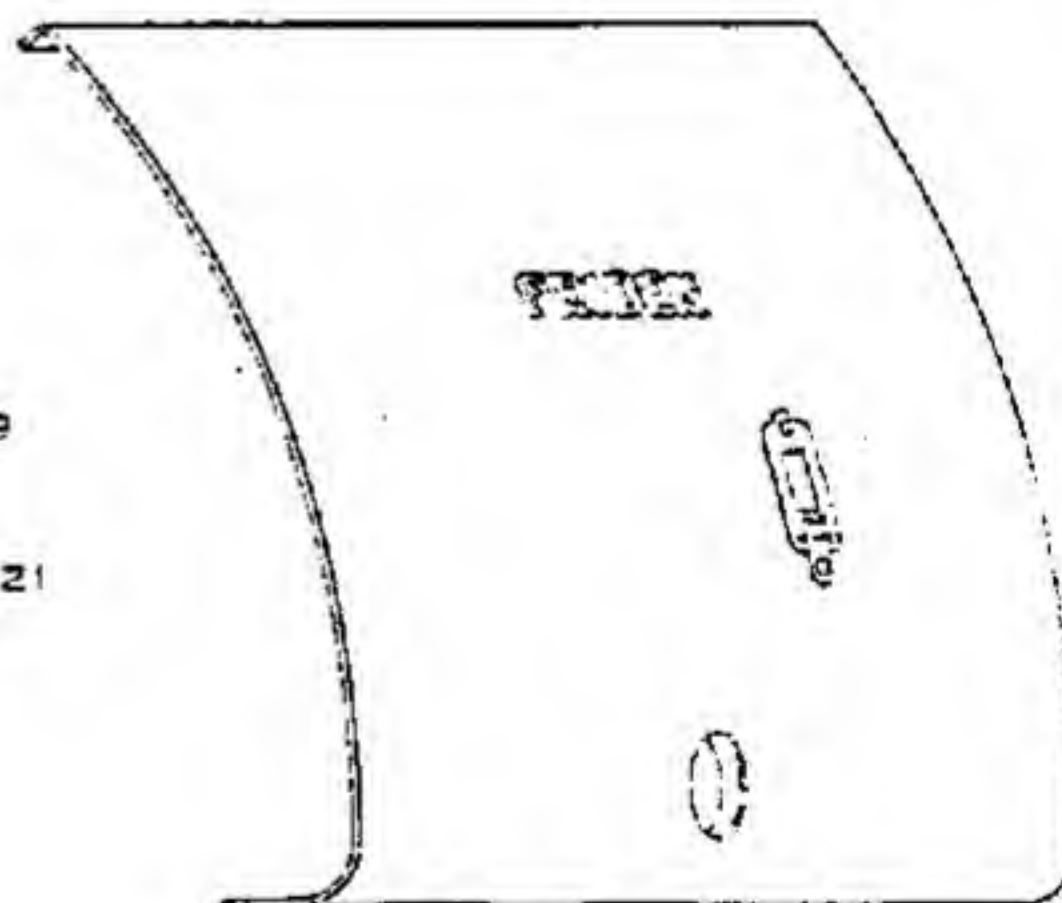
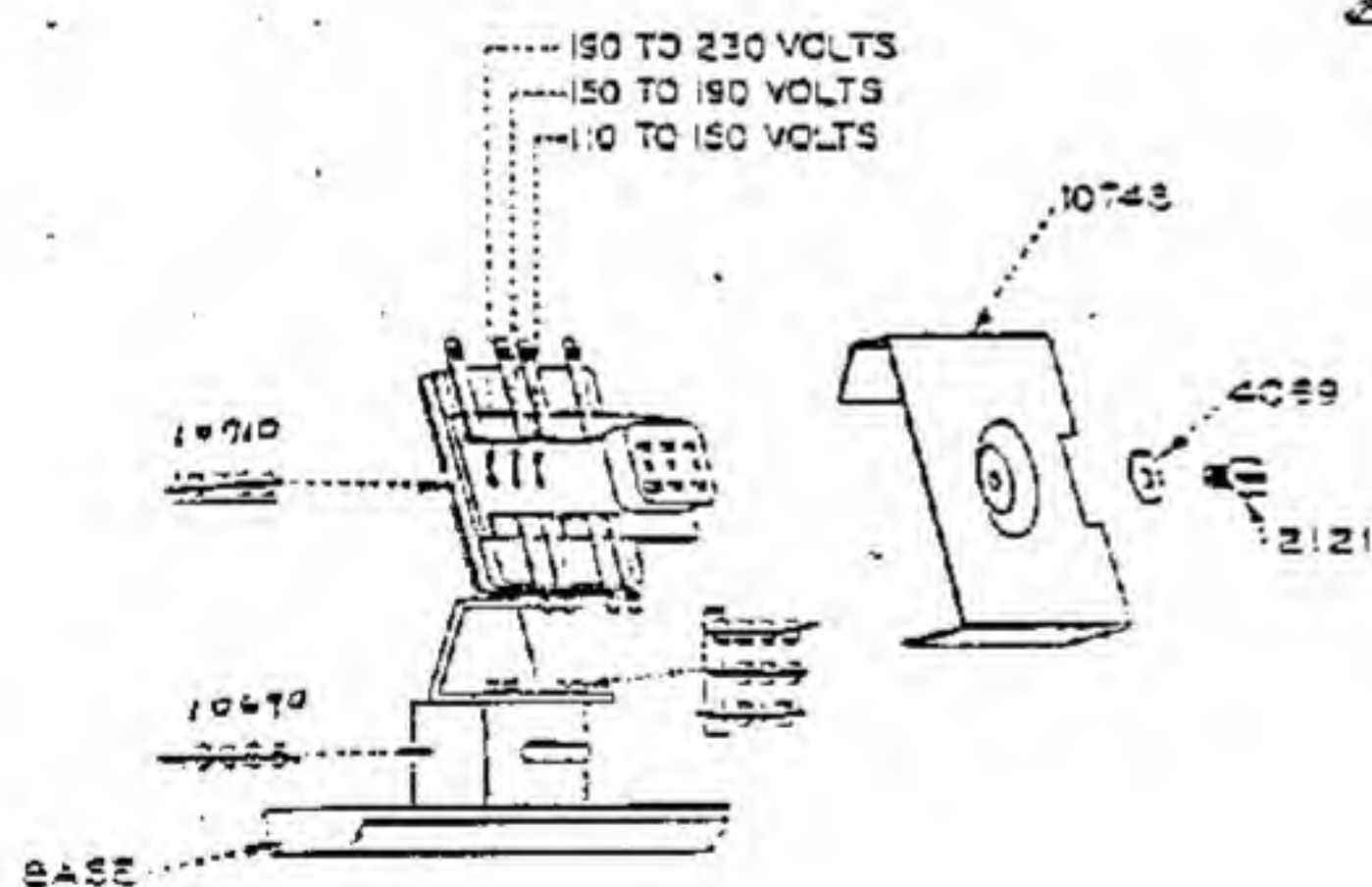
To replace obsolete part #11348 with the above parts, it is necessary to drill and countersink two holes in the Front Top Cover. Use the dimensions given above for locating these holes. After locating the hole on the left side, the Retainer #11387 may be used in locating the hole on the right side. Use a #42 Drill for the holes and a 1/4" Drill for countersinking.







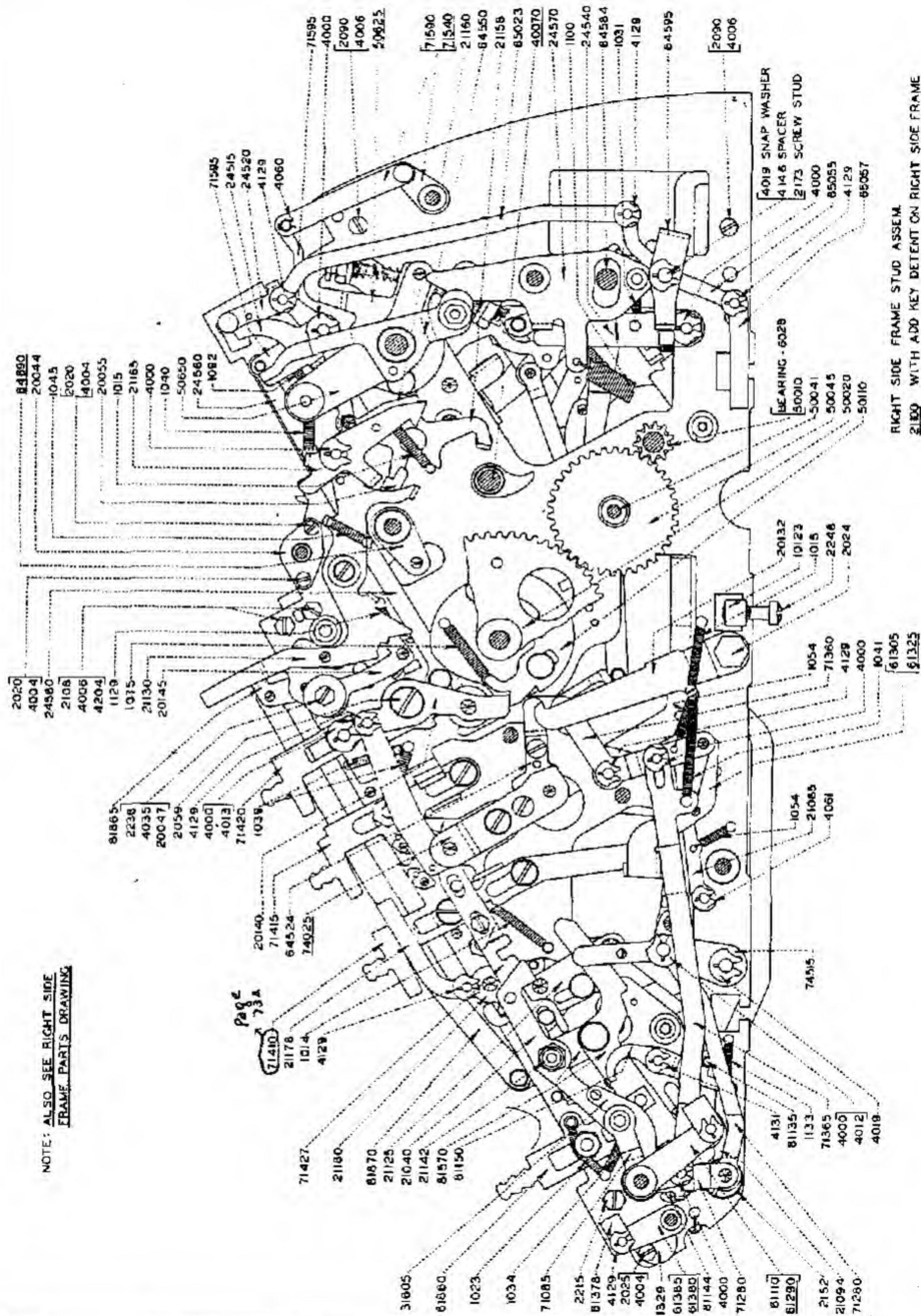
10775 MOTOR + SWITCH ASSEMBLY
10735 MOTOR, SWITCH + SUB BASE ASSEMBLY



BACK COVER ASSEMBLY
10795 - C-W - DW
10790 - S-TW
10780 - S - ST
10785 - C - C 8BANK
10785T - C - C 10BANK

FRIDEN CALCULATING MACHINE CO., INC.
RIGHT SIDE FRAME — R.H.S.

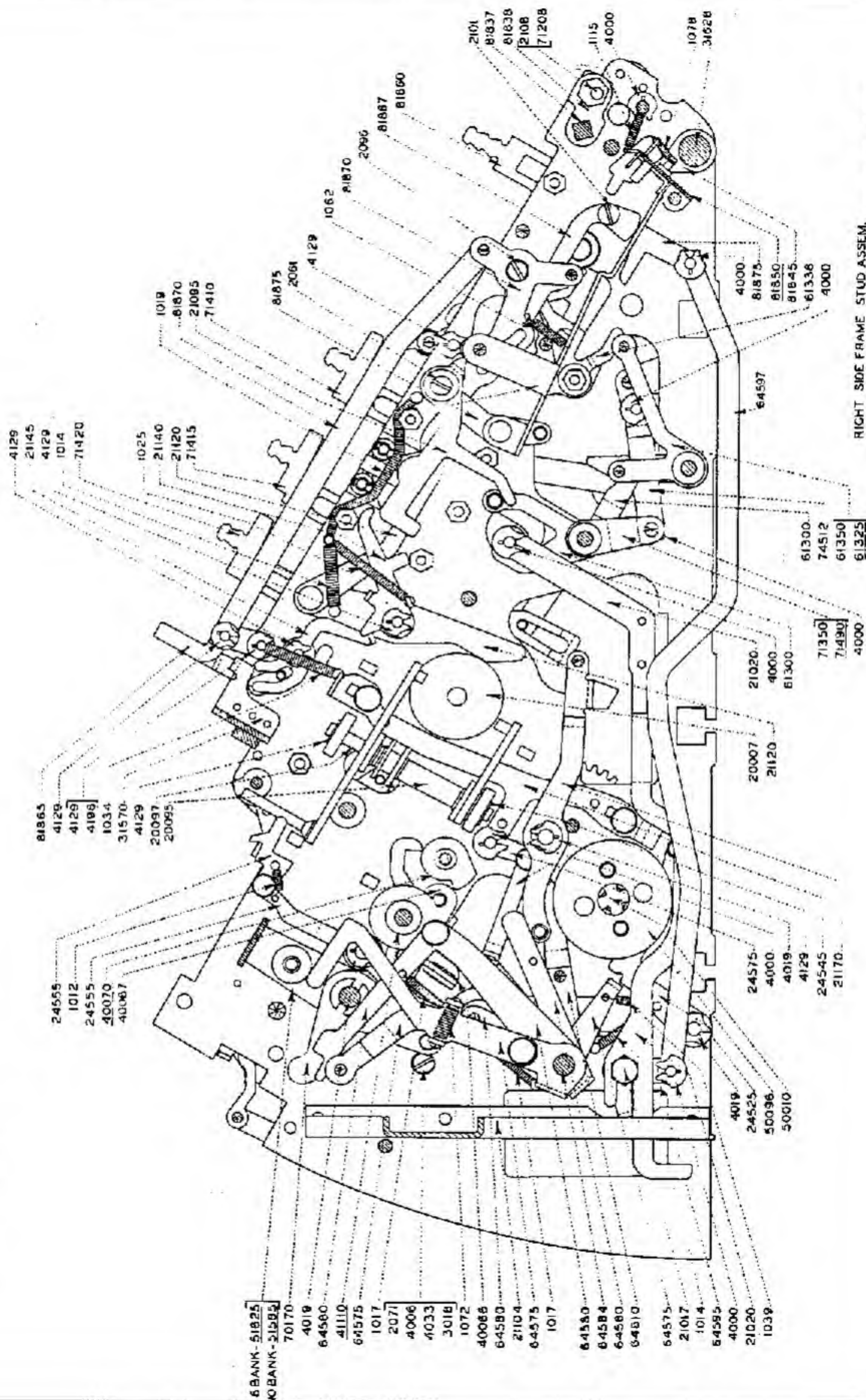
MODEL STW



FRIDEN CALCULATING MACHINE CO., INC.
RIGHT SIDE FRAME — L.H.S.

6-15-50

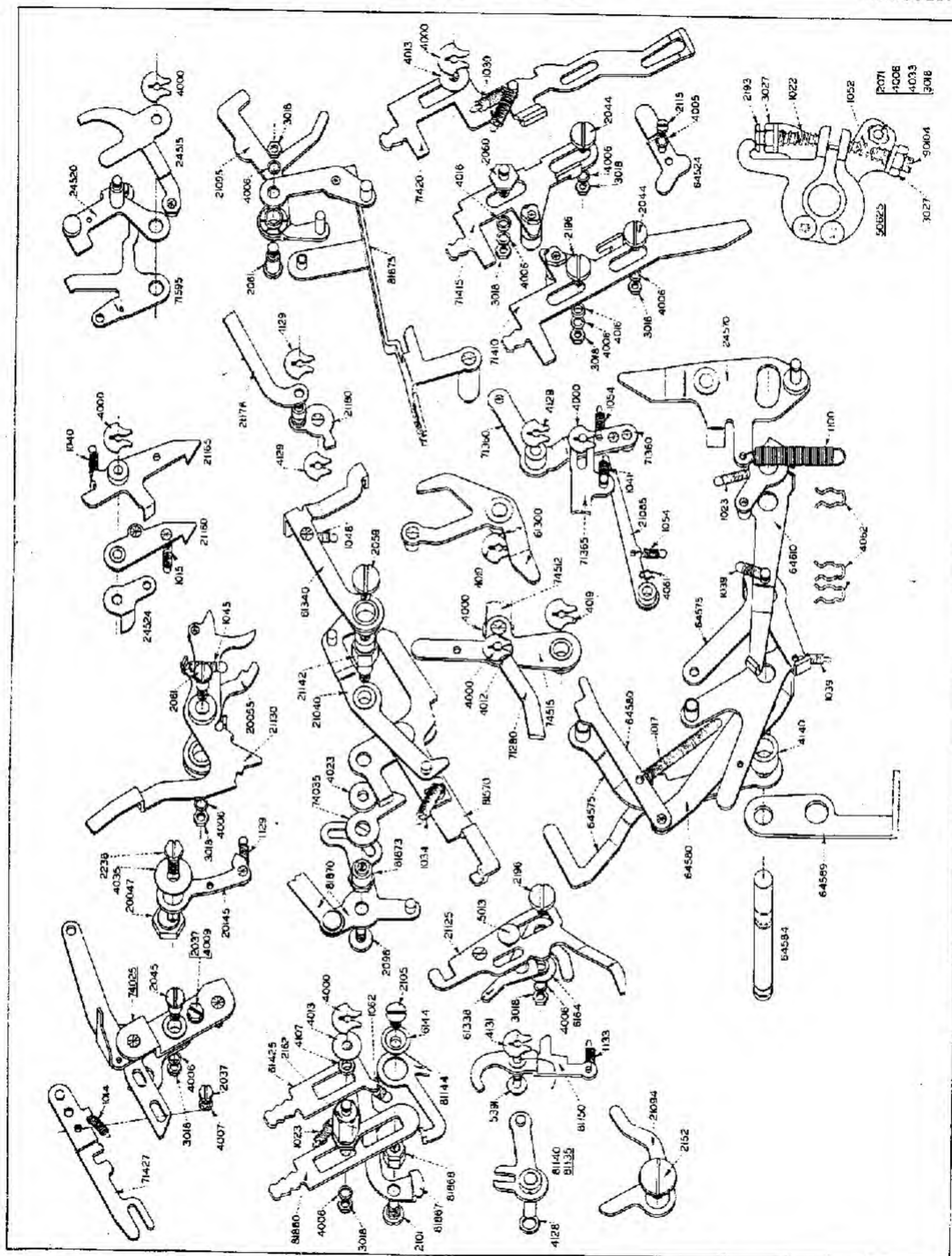
NOTE: ALSO SEE RIGHT SIDE
FRAME PARTS DRAWING



RIGHT SIDE FRAME STUD ASSEM.
21100 WITH ADD KEY DETENT ON RIGHT SIDE FRAME
21100.5 " " " " " CONTROL PLATE

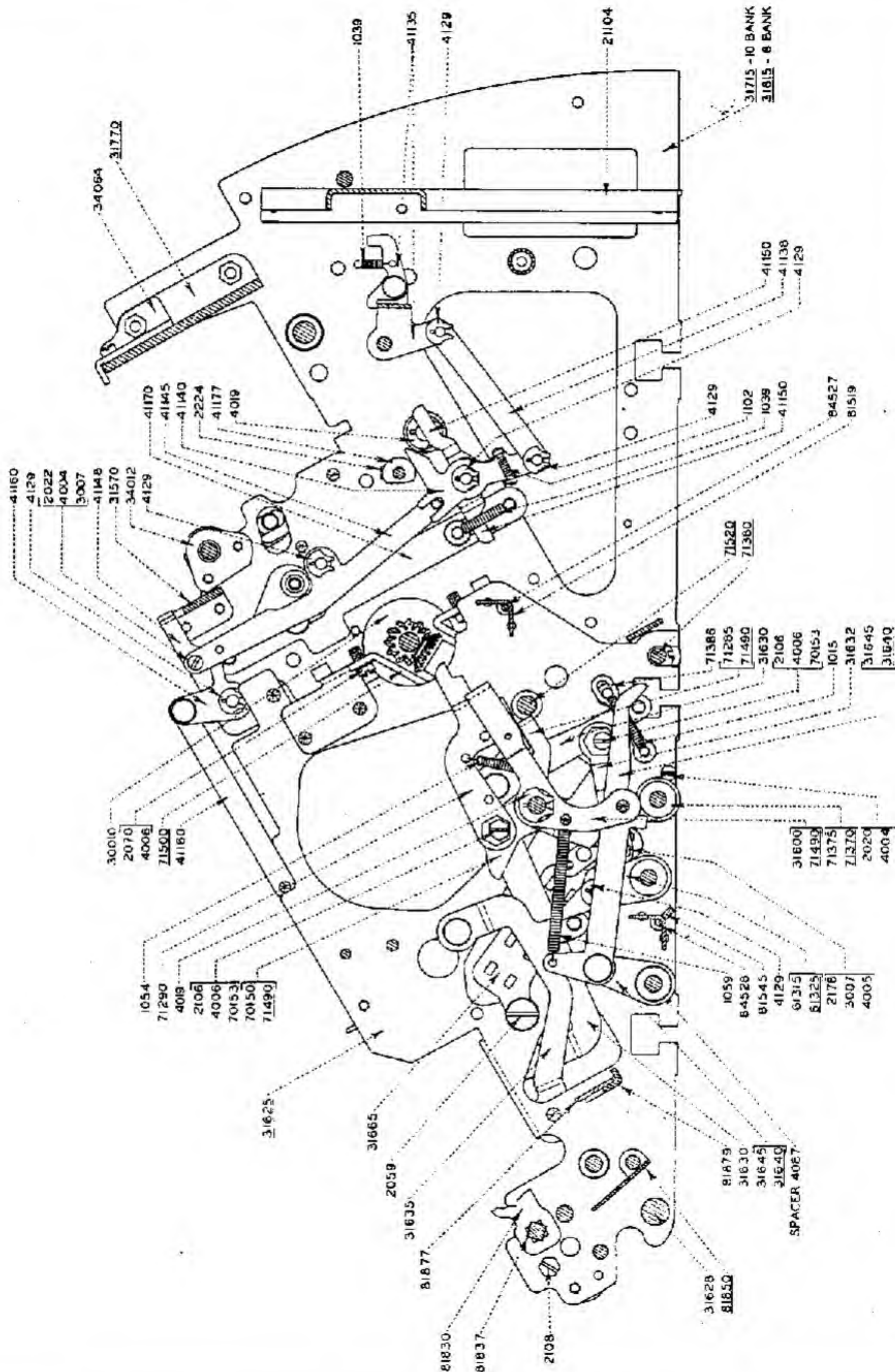
FRIDEN CALCULATING MACHINE CO., INC.
RIGHT SIDE FRAME PARTS

MODEL STW



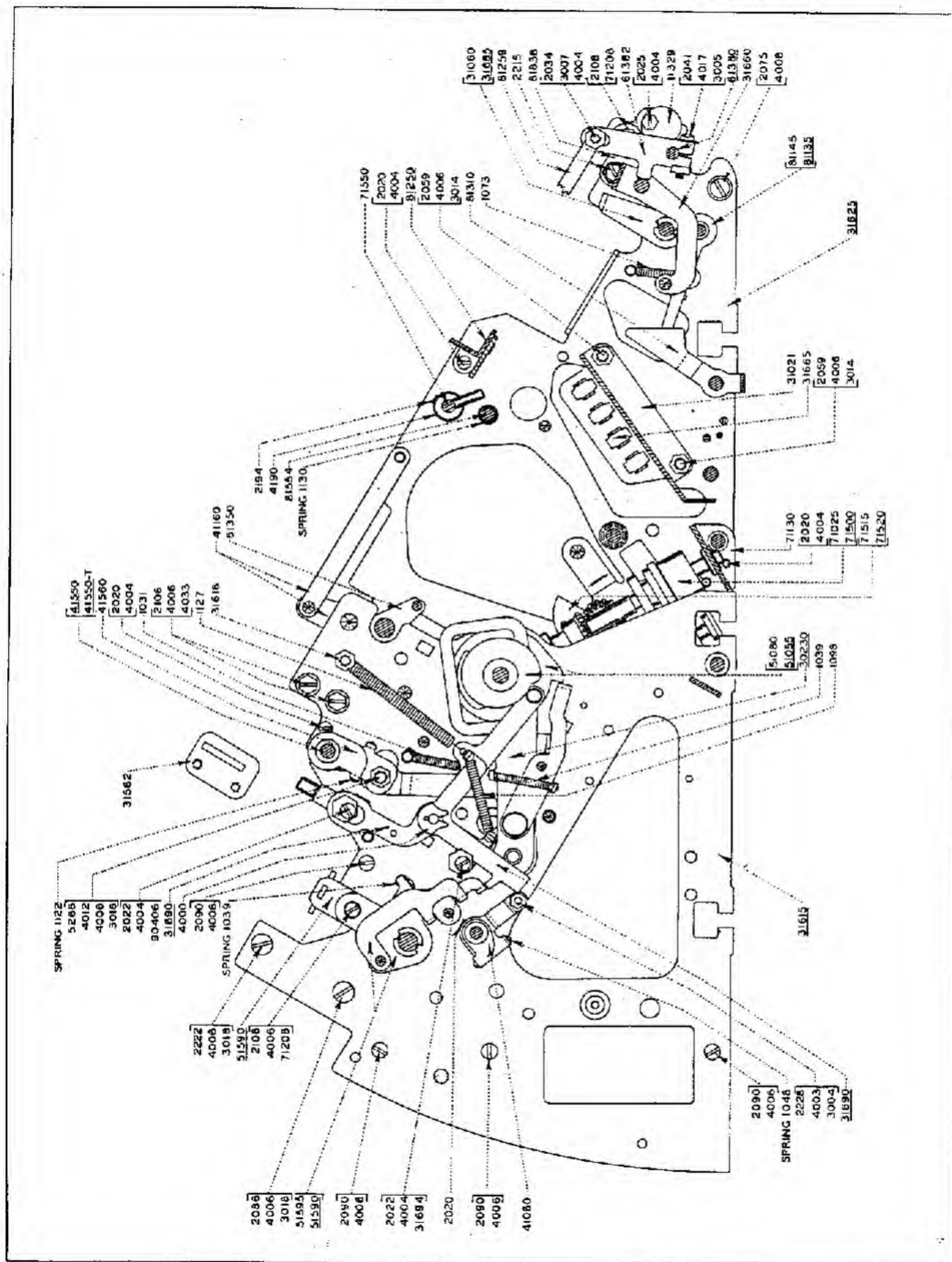
FRIDEN CALCULATING MACHINE CO., INC.
INSIDE AUXILIARY AND LEFT SIDE FRAME (REAR SECTION) R.H.S.

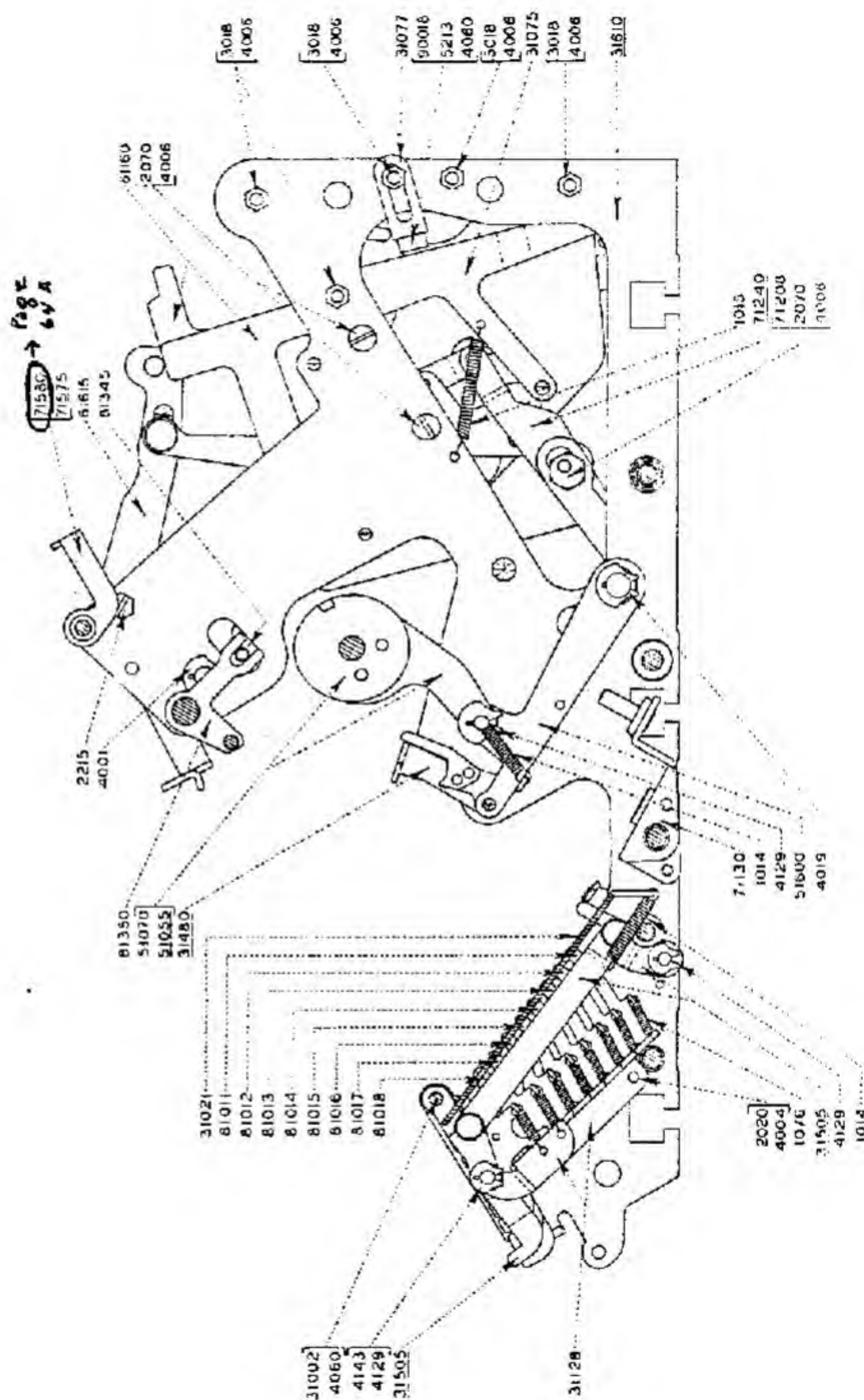
6-15-50



INSIDE AUXILIARY AND LEFT SIDE FRAME (REAR SECTION) L.H.S. (COMPLETE TRANSFER)

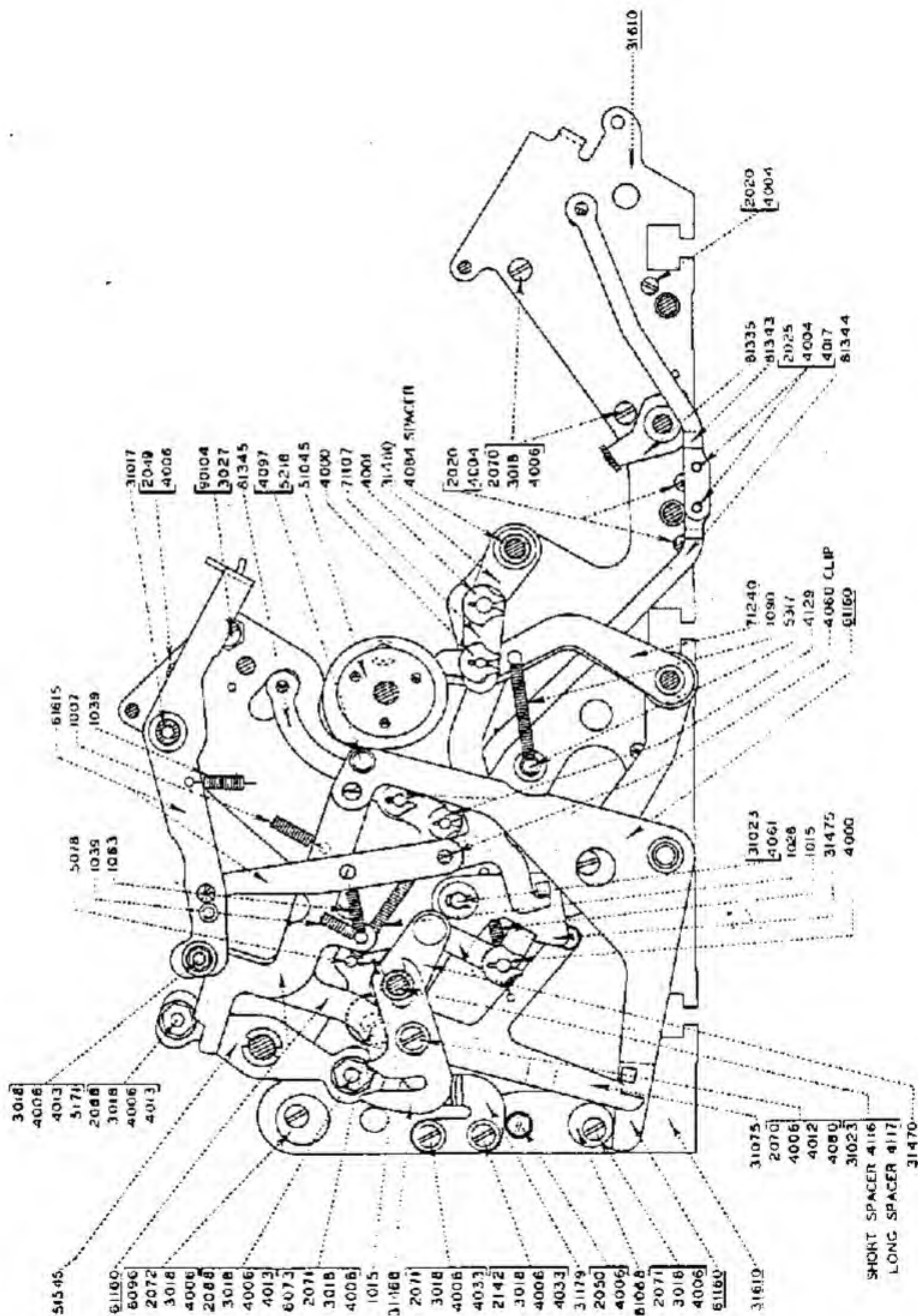
6-15-50



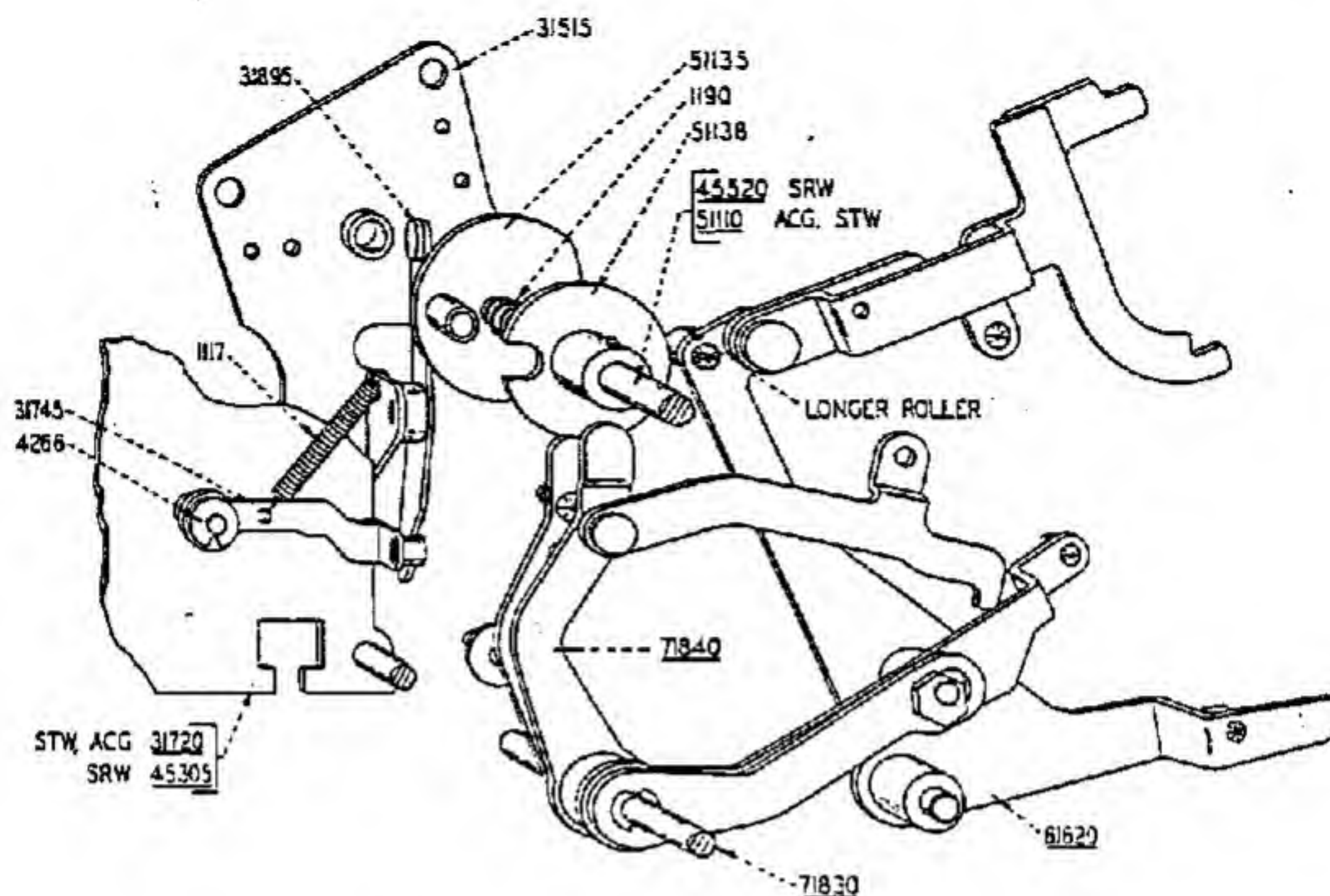
FRIDEN CALCULATING MACHINE CO., INC.
LEFT SIDE FRAME STUD ASSEMBLY R.H.S.Page 61
MODEL STW

FRIDEN CALCULATING MACHINE CO., INC.
LEFT SIDE FRAME STUD ASSEMBLY L.H.S.

5-13-50



REVISED POWER SET CAM



PARTS LIST AND INSTRUCTIONS

KEEP YOUR SERVICE MANUALS UP TO DATE

Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page. Manual location: Page 62, 63, 64, 64B, 73B.

1117	Spring		New Usage
1190	Spring for Power Set Cam	Replaces	1070
4266	Snap Washer		New Usage
31515	Main Drive Shaft Bearing Plate Assem.		Revised - INT.
31720	Outside Aux. Left Frame Stud Assem.		Revised - INT.
31745	Throwout Lever Actuating Arm Assem.		New Part
31895	Power Set Cam Throwout Lever Assem.	Replaces	31835 - N. INT.
45305	Outside Aux. Left Frame Stud Assem. SRW		Revised - INT.
45520	Main Drive Shaft Assem. SRW-10	Replaces	45510 - N. INT.
51110	Main Drive Shaft Assem. ACG-10, STW-8, STW-10	Replaces	51100 - N. INT.
51135	Power Set Cam Assem. Plus and Minus Gate	Replaces	51145 - N. INT.
51138	Driving Arm, Power Set Cam		New Part - N. INT.
61620	Power Set Levers Assem.	Replaces	61160 - N. INT.
71830	Carriage Shift Shaft Assem.		Revised - INT.
71840	Power Set Latch Release Lever Assem.		Revised - INT.

Reason for Change: To disengage the Power Set Cam from 71840 in all operations except Multiplication. Prevents overlatching noise of 71840.

EFFECTIVE IN MODELS ABOVE SERIAL #:

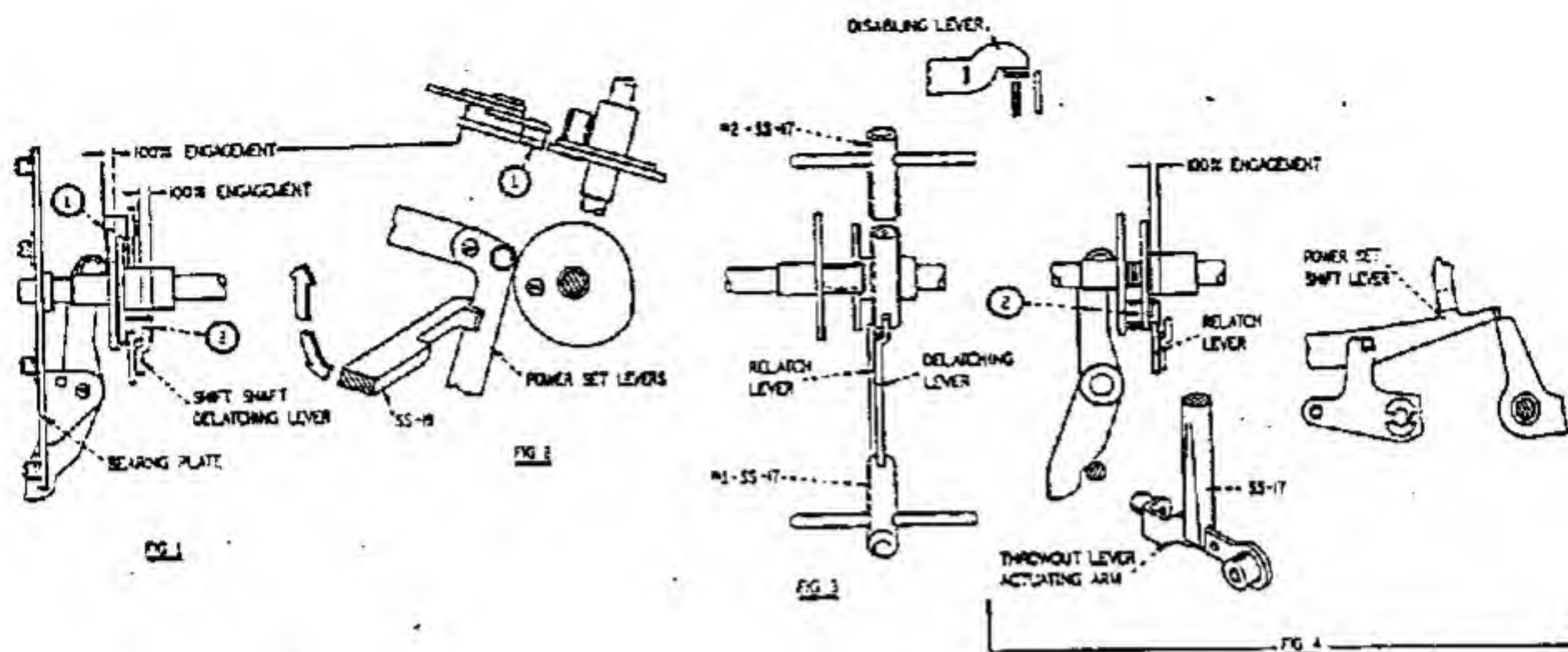
STW-8 - 336757

STW-10 - 549694

ACG-10 - 549770

INSERT IN YOUR SERVICE MANUAL

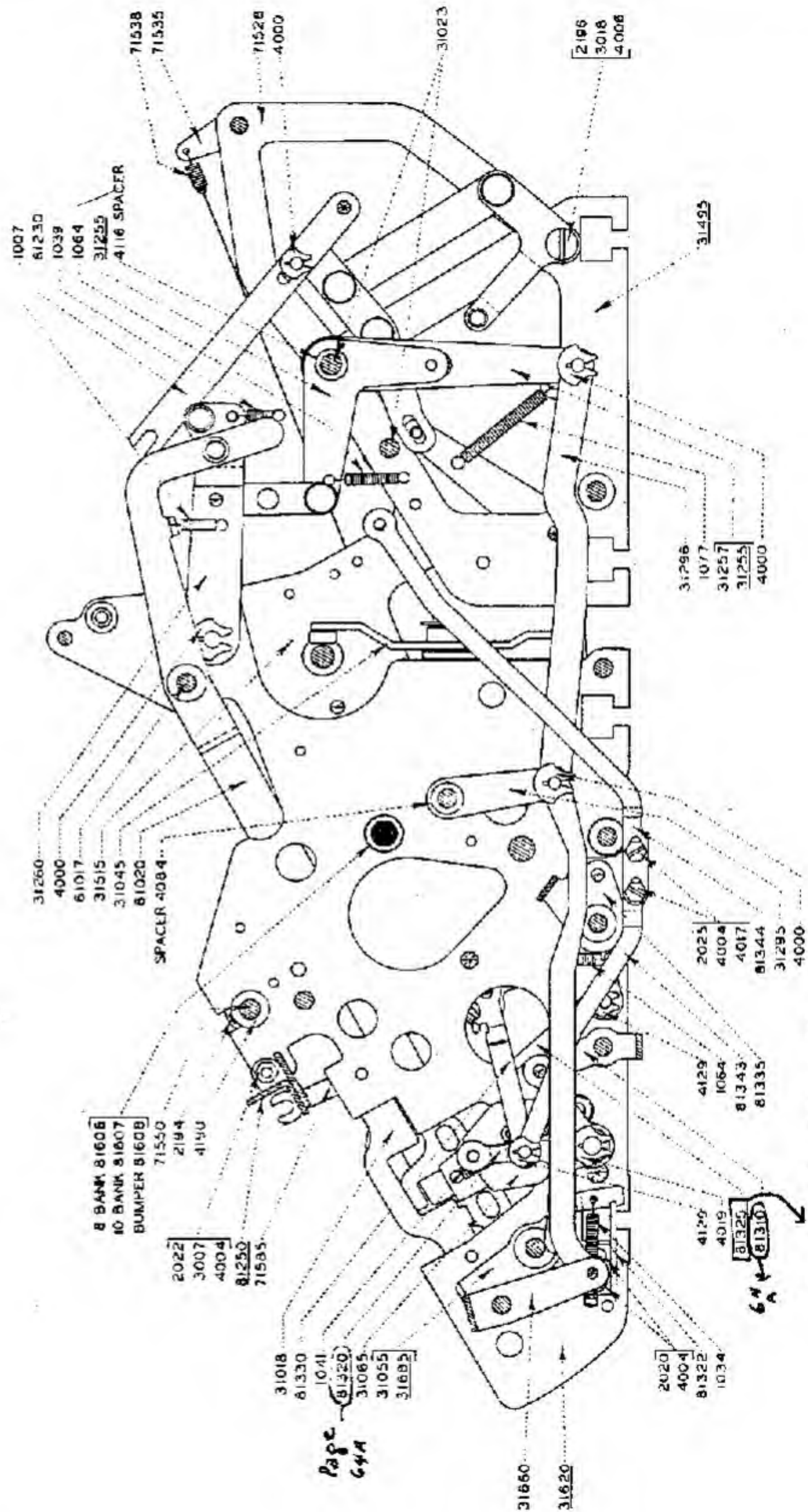
ADJUSTMENTS



Adjustment: Step 1, Fig. 1, position the Bearing Plate counter-clockwise until limited. Tighten the Screws and rotate the drive shaft to test for freeness. Step 2, Fig. 1, select a three, depress the Mult. Key and rotate the Drive Shaft until the Power Set Cam has moved completely in and the Segment is starting to feed out. The Power Set Cam is to have 100% engagement with Roller 1, and the Shift Shaft Delatching Lever is to have 100% engagement with Roller 2. Form the Power Set Levers, Fig. 2, to align Roller 1 to the Power Set Cam. To obtain the 100% engagement of the Delatching Lever to Roller 2, restore the machine, select a figure, depress the Disabling Lever and pull the Delatching Lever forward. Place the machine on its back, hold the Delatching Lever, Fig. 3, with #1 SS-17 and form with #2 SS-17. This also removes side play in the Delatching Lever, therefore, test that it is not too tight against the Relatch Lever. Step 3, Fig. 4, restore the machine and depress the Mult. Key. Rotate the Drive Shaft by hand until the Power Set Shift Lever has restored onto its latches and Roller 2 is picking up the Relatch Lever. The Relatch Lever is to have 100% engagement with Roller 2. Form the Throwout Lever Actuating Arm to the left to increase the engagement.

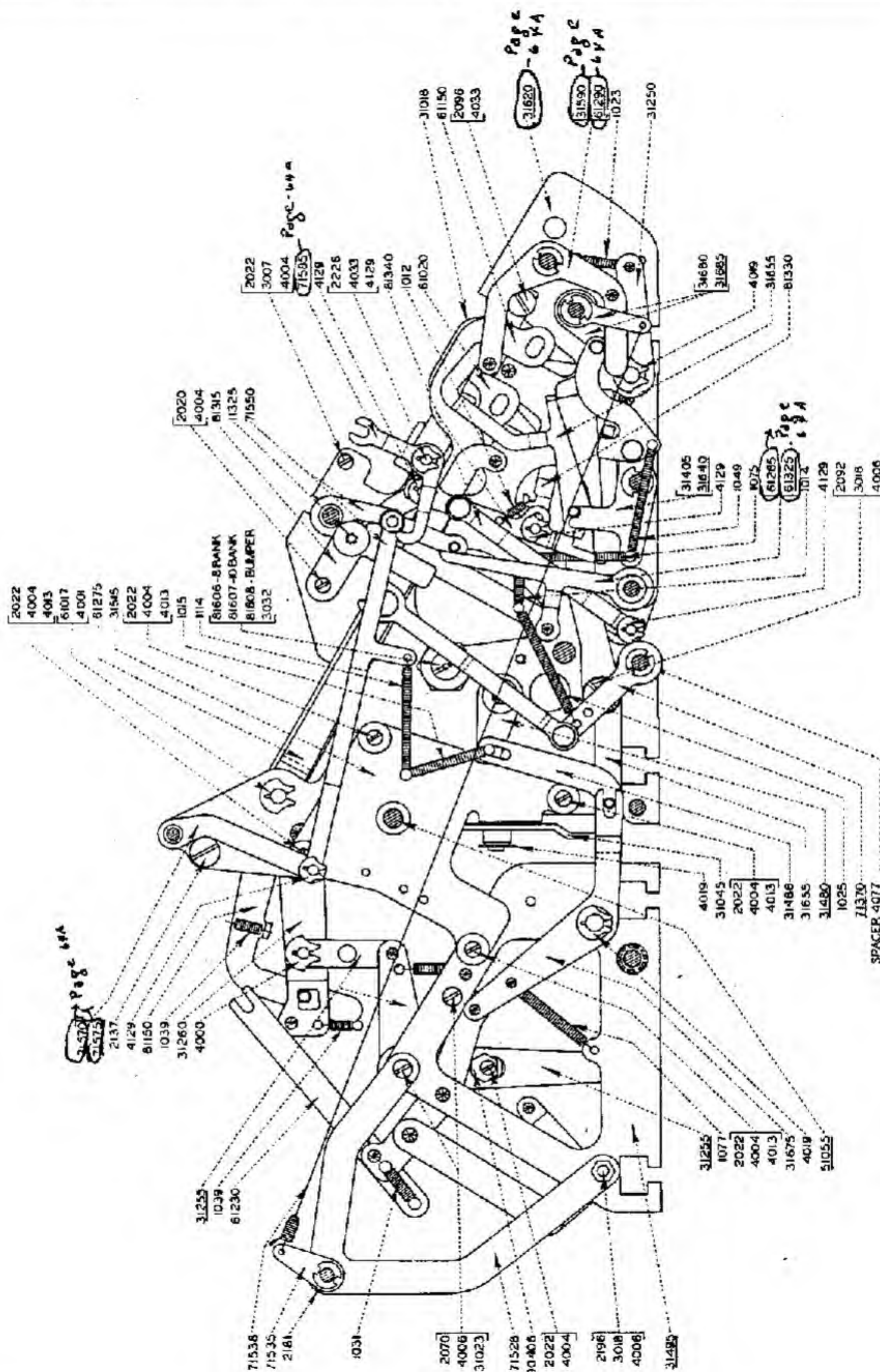
When the Power Set Shift Lever restores, the Throwout Lever Actuating Arm, actuated by the stud on the Relatch Lever takes over and holds the Throwout Lever. This action is necessary to keep Roller 2 of the Power Set Cam in contact with the Relatch Lever so the Shift Shaft Latch is related.

FRIDEN CALCULATING MACHINE CO., INC.
OUTSIDE AUXILIARY LEFT FRAME (FRONT) R.H.S.



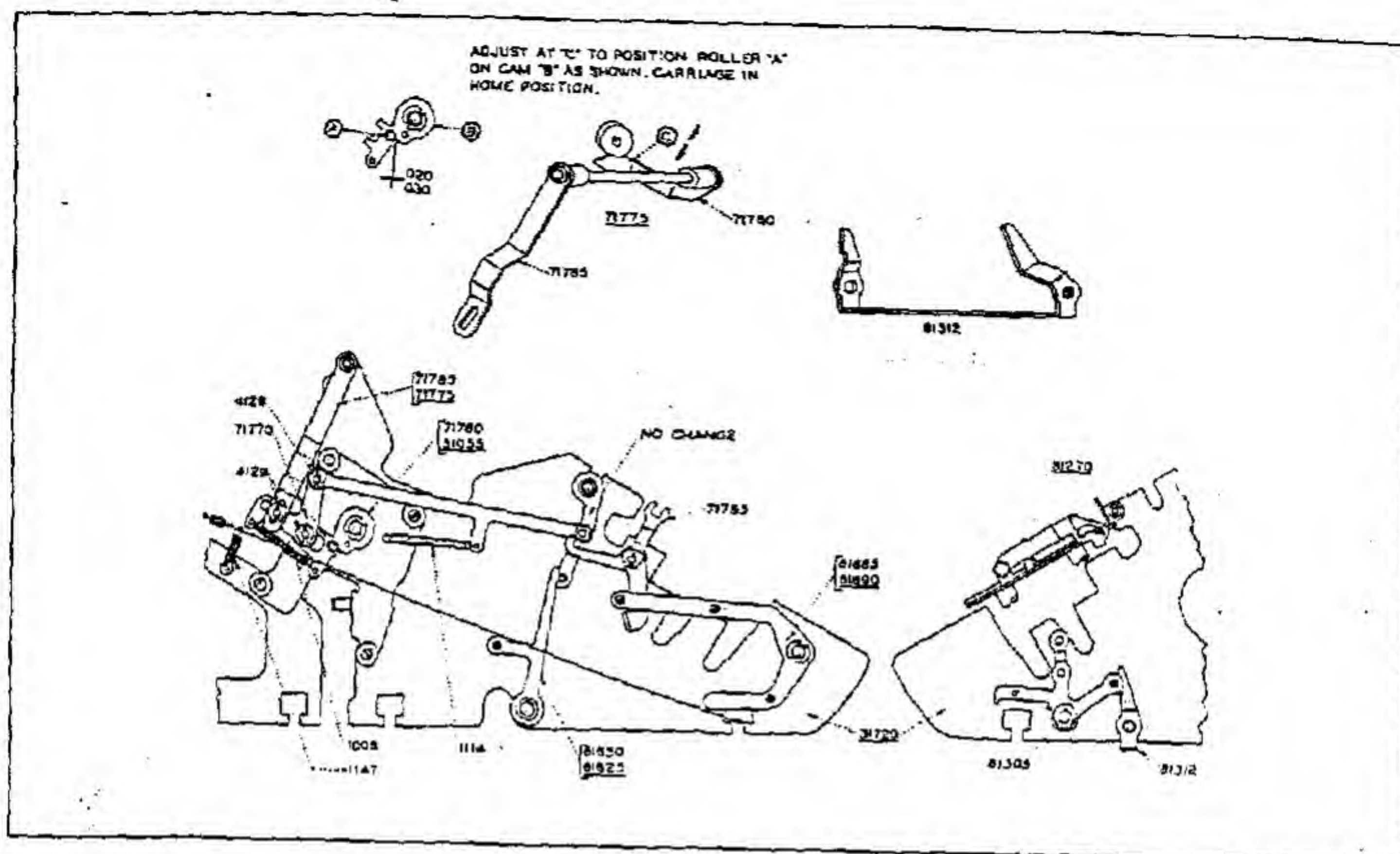
New latch 81310 on
Page 64A - Eliminates
Above Part.

Page
64A



FRIDEN CALCULATING MACHINE CO., INC.
OUTSIDE AUXILIARY LEFT FRAME -- PARTS CHANGES
INSTANT CARRIAGE RETURN AND REPEAT MULT. LOCK

Page 64A
MODEL STW



PARTS LIST AND INSTRUCTIONS

KEEP YOUR SERVICE MANUALS UP TO DATE

Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page.

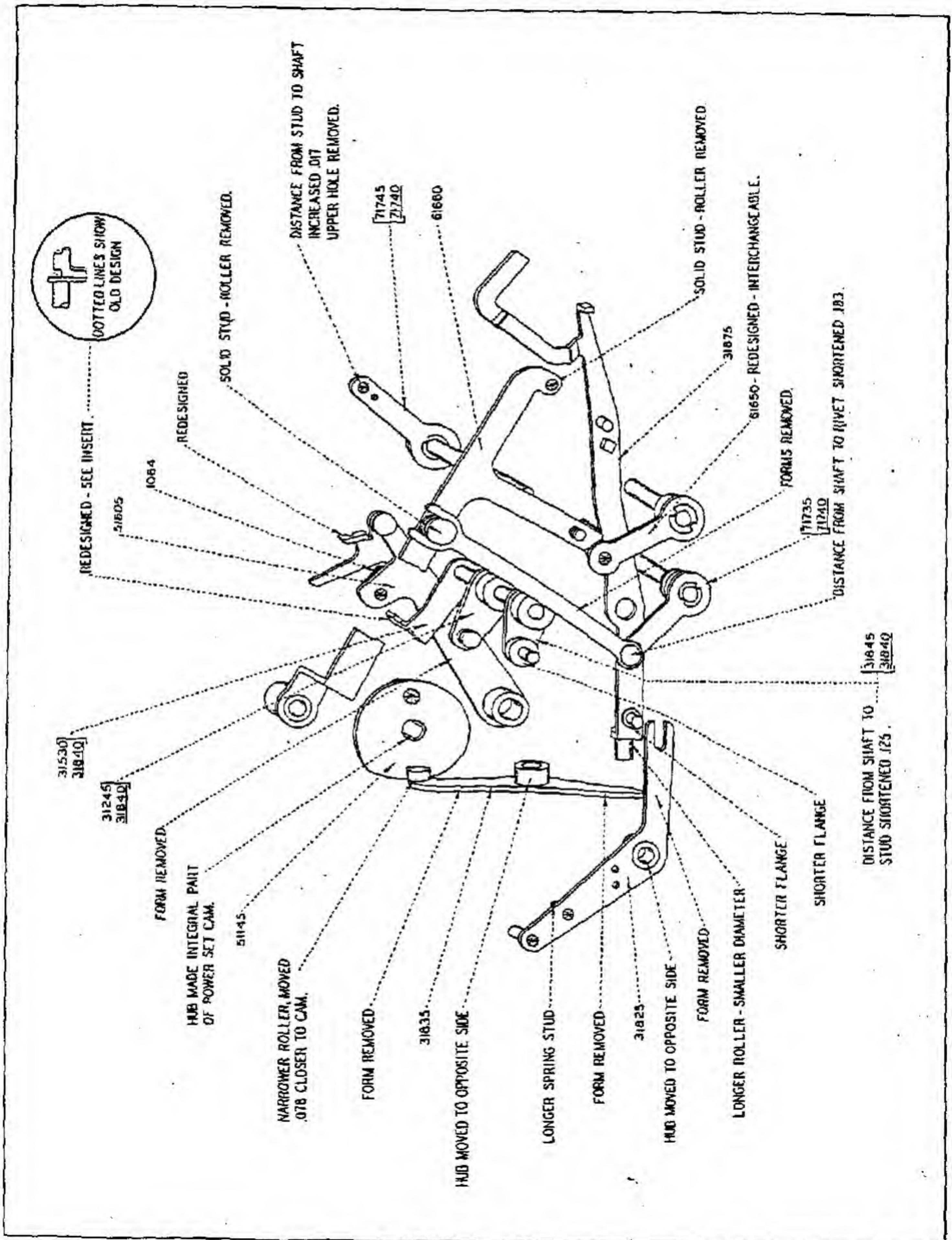
1008	Spring - New Usage			
1147	Spring - Guide for 71538			
4129	Snap Washer - New Usage			
<u>31720</u>	Outside Aux. Left Frame Stud Assem. - Front	Replaces	<u>31620</u>	- N.INT.
<u>61625</u>	Clutch Control Shaft & Levers Assembly	"	<u>61325</u>	- N.INT.
61650	Mult. Unit Keys Clutch Opening Lever Assem.	"	61285	- N.INT.
61683	Interlock Operating Lever Assembly	"	31590	- N.INT.
<u>61690</u>	Interlock Operating Shaft Assembly	"	<u>61290</u>	- N.INT.
71760	Instant Carriage Restore Cam Assembly - New Part			
71765	Mult. Unit Keys Shift Disabling Lever Assem.	Replaces	71585	- N.INT.
71770	Restore Bellcrank Assembly - New Part			
<u>71775</u>	Restore and Actuating Arms Assembly	"	<u>71575</u>	- N.INT.
71780	Restore Arm & Hub Assembly	"	71580	- N.INT.
71785	Restore Arm Actuating Arm Assembly	"	71570	- N.INT.
<u>81270</u>	Top Plate Assembly	"	<u>81250</u>	- N.INT.
81305	Mult. Unit Position Selector Lock Assembly	"	81320	- N.INT.
81312	Mult. Clear Key Interlock	"	81310	- N.INT.
	(81325 Latch is eliminated by this change.)			

NOTE 1: Adjustment for Instant Carriage Return shown above replaces Adjustment #132 and eliminates Adjustment #133 on page 39 for this style mechanism only. No other Instant Carriage Return Adjustments affected.

NOTE 2: Repeat Multiplier Lock mechanism shown above eliminates Adjustment #135 on page 40.
No other Repeat Adjustments affected.

INSERT IN YOUR STW SERVICE MANUAL FACING PAGE 64

MULTIPLIER PARTS CHANGES



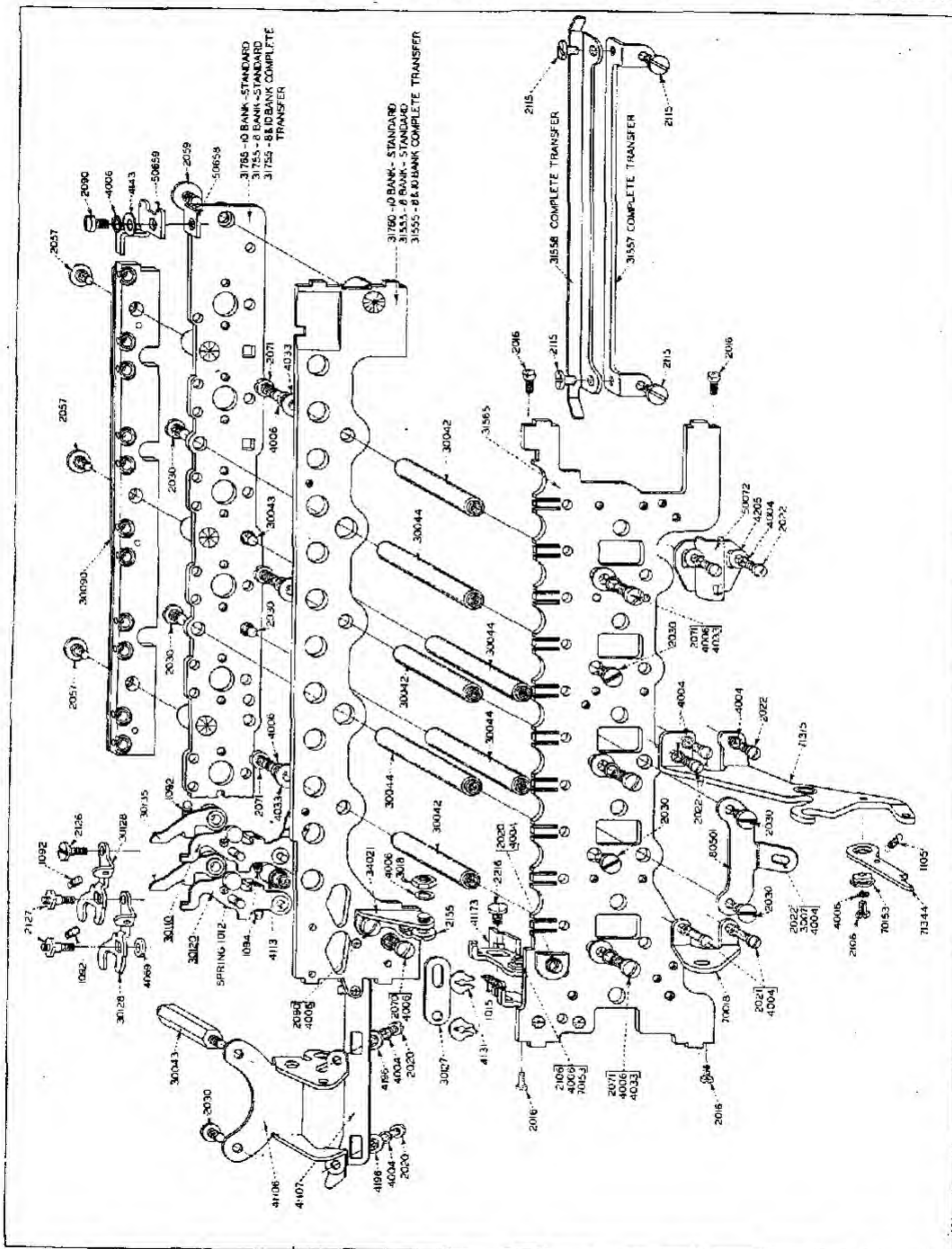
PARTS LIST

1064	Spring - New Usage	Replaces 1014 - N. Int.
31245	Latch Connecting Link Lever Assembly	No Change
31530	Mult. Segment Holding Pawl Sub Assembly	Revised - Int.
31825	Mult. Restore Latch Control Lever Assembly	Replaces 31675 - N. Int.
31835	Power Set Cam Throwout Lever Assembly	Replaces 31045 - N. Int.
<u>31840</u>	Mult. Segment Holding Pawl Assembly	Replaces 31780 - N. Int.
31245	Latch Connecting Link Lever Assembly.	
31530	Mult. Segment Holding Pawl Sub Assembly.	
31845	Holding Pawl Actuating Lever Assembly.	
7033	6/0 X 1/2" Taper Pin.	
31845	Holding Pawl Actuating Lever Assembly	Replaces 31775 - N. Int.
31875	Power Set Cam Shift Lever Assembly	Replaces 31655 - N. Int.
51145	Power Set Cam Assembly	Replaces 51045 - N. Int.
51605	Multiplier Feed Lever Assembly	Replaces 51600 - N. Int.
61650	Multiplier Clutch Opening Lever Assembly (Lower)	Revised - Int.
61660	Multiplier Clutch Opening Lever Assembly (Upper)	Replaces 61275 - Int.
71735	Return Clear Disabling Lever Assembly	Replaces 31225 - Int.
<u>71740</u>	Clear Disabling Levers and Shaft Assembly	Replaces 71370 - Int.
71372	Clear Disabling Levers Shaft.	
71735	- Return Clear Disabling Lever Assembly.	
71745	Clear Disengaging Lever Assembly.	
7033	6/0 X 1/2" Taper Pin.	
71745	Clear Disengaging Lever Assembly	Replaces 71375 - Int.

INSERT IN YOUR SERVICE MANUAL

FRIDEN CALCULATING MACHINE CO., INC.

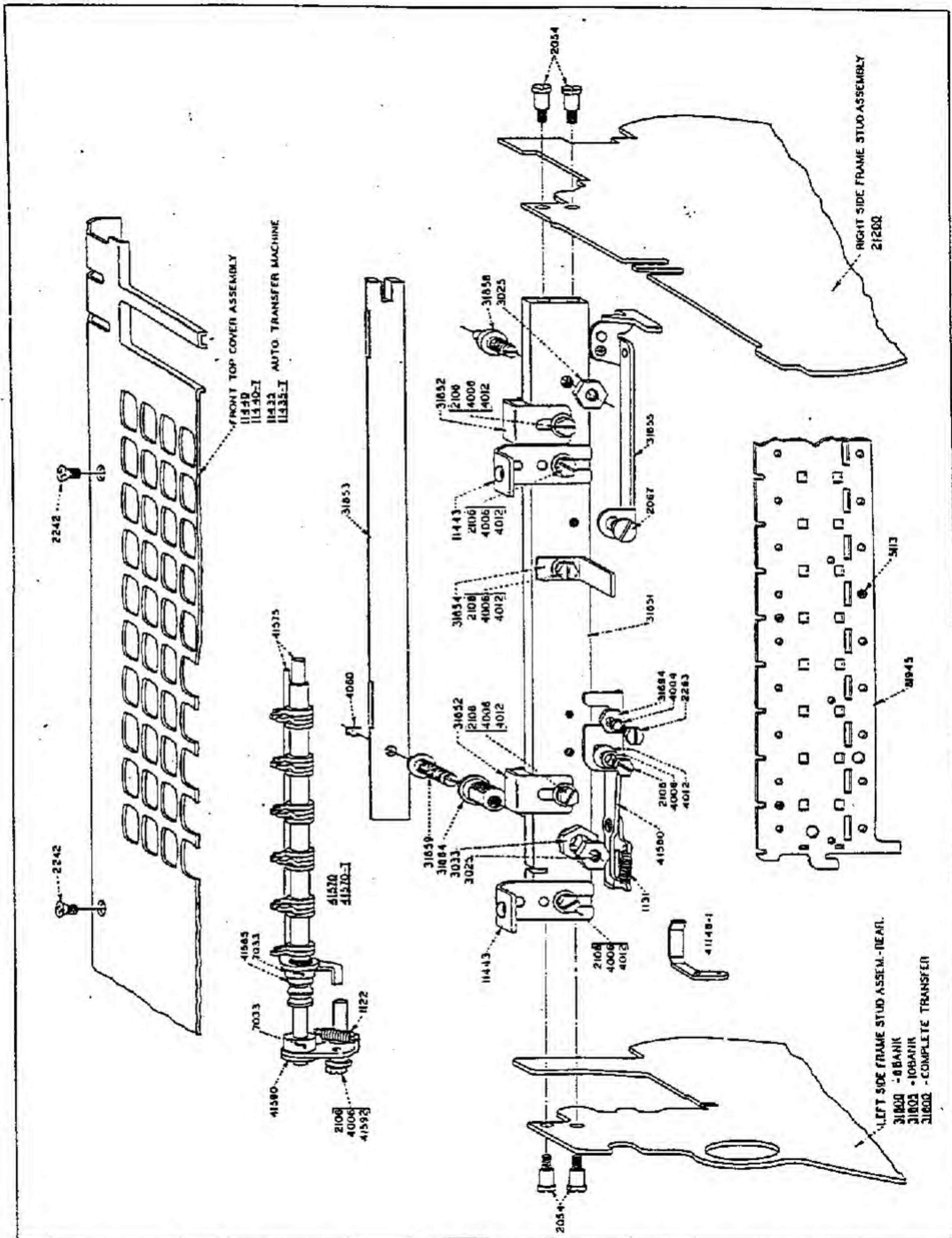
FRONT AND CENTER BEARING PLATE ASSEMBLY



FRIDEN CALCULATING MACHINE CO., INC.

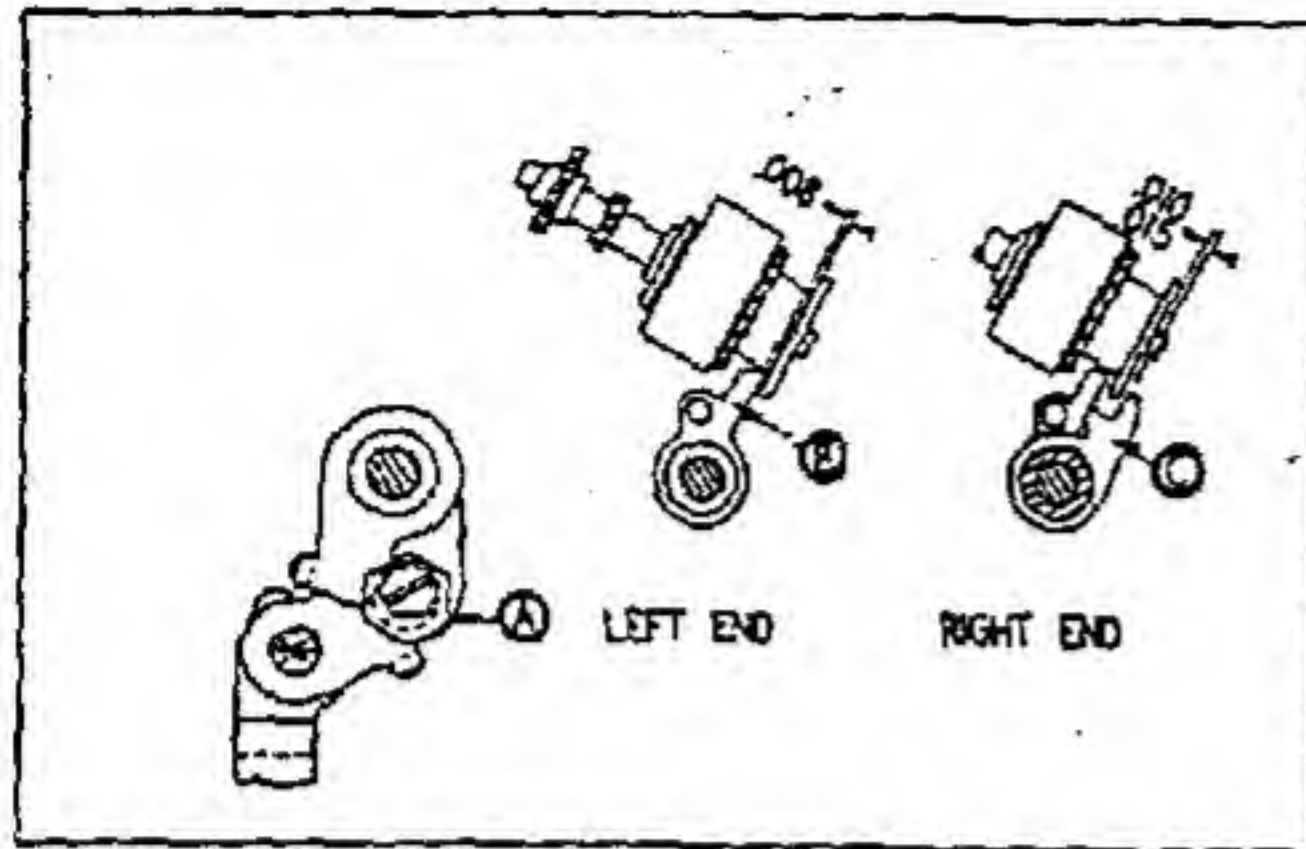
CARRIAGE SUPPORT BAR

MODEL STW

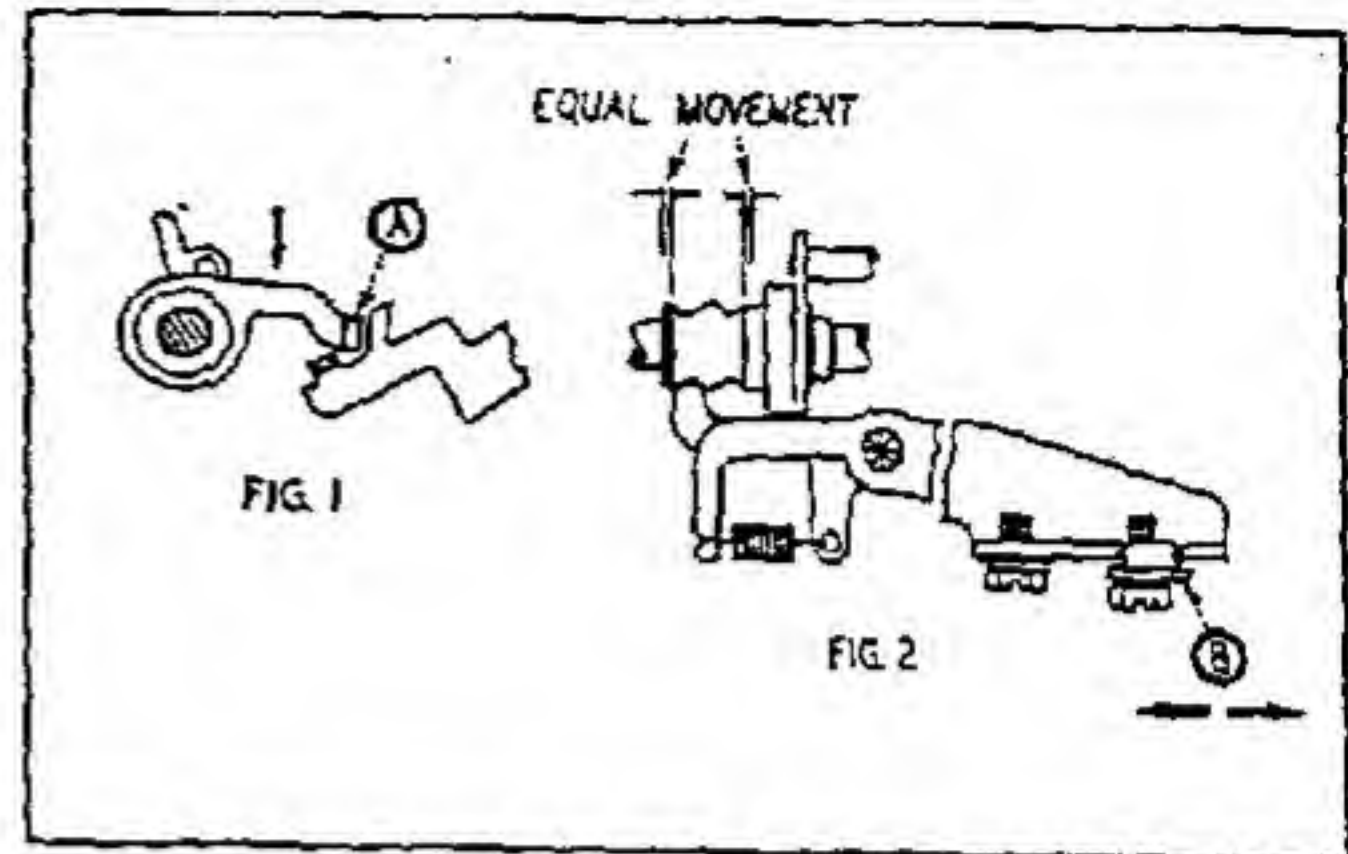


FRIDEN CALCULATING MACHINE CO., INC.

CARRIAGE SUPPORT BAR ADJUSTMENTS



88. COUNTER ROCKER LEVER: Machine in Home Position, Rocker Lever should hold Counter Fingers so Primary Finger B at left end of Counter clears Counter Blockout Cam .008 minimum as shown. Secondary Finger C on right end of Counter clears Cam .010 to .015 as shown. Adjust at Eccentric A.



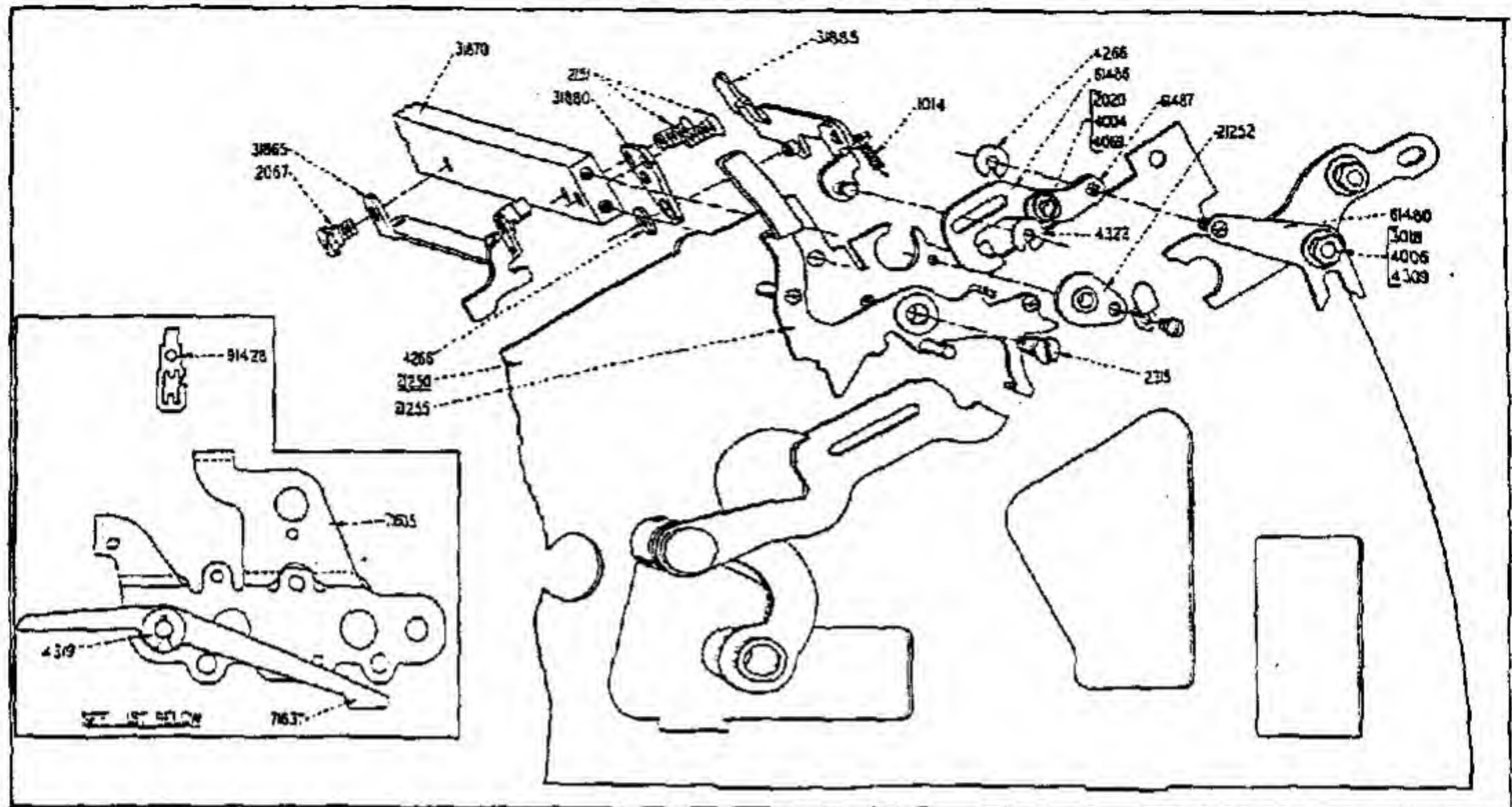
90 1/2. COUNTER CENTRALIZER: Depress Plus Key and rotate Drive Shaft by hand until Locking Lip A (fig. 1) stops its downward motion. This positions Lower Stud on Oscillator Arm in the narrow part of the Oscillator Cam Groove. Counter Assembly is to have equal movement right and left from center. Adjust Eccentric B.

PARTS LIST

1122	Spring.
1131	Spring.
2034	6-40 Special Screw.
2067	6-40 Special Screw.
2106	6-40 Hex. Head Screw.
2242	4-36 Oval Phillips Head Screw.
2263	4-48 Hex. Head Screw.
3025	10-32 Hex. Nut.
3033	5/16-32 Hex. Nut.
4004	#4 Lockwasher.
4006	#6 Lockwasher.
4012	Washer.
4060	Spring Clip.
5113	Stud.
7033	6/0 X 1/2" Taper Pin.
<u>11435</u>	Front Top Cover Assem. - 8 Bank - Automatic Transfer.
<u>11435-T</u>	Front Top Cover Assem. - 10 Bank - Automatic Transfer.
<u>11440</u>	Front Top Cover Assem. - 8 Bank.
<u>11440-T</u>	Front Top Cover Assem. - 10 Bank.
11443	Front Top Cover Bracket - Rear.
<u>21200</u>	Right Side Frame Stud Assem.
31694	Eccentric.

<u>31800</u>	Left Side Frame Stud Assem. - (Rear Section) 8 Bank.
<u>31805</u>	Left Side Frame Stud Assem. - (Rear Section) 10 Bank.
31851	Carriage Support Bar.
31852	Carriage Rail Retainer.
31853	Slide for Carriage Rail.
31854	Hold Down Bracket for Keyboard - Rear.
31855	Tabulator Actuator Lever.
31858	Pivot Stud for Carriage Rail Slide.
31859	Pivot Stud for Carriage Eccentric.
31864	Carriage Adjustment Eccentric Bushing.
<u>41148-1</u>	Sensing Finger Detecting Lever.
<u>41570</u>	Counter Assembly - 8 Bank.
<u>41570-T</u>	Counter Assembly - 10 Bank.
<u>41575</u>	Counter Frame Assembly.
41580	Centralizer Pawl Assembly.
41585	Counter Arm Assem. - Left.
41590	Counter Rocker Lever Assem.
41592	Eccentric.
81945	Rear Key Section Support Assem.

Automatic Division Stop



PARTS LIST AND INSTRUCTIONS

Keep Your Service Manuals up to Date

Locate and circle the parts numbers affected by this supplement wherever they appear in the manual and make a note to see this page. Manual locations: STW, pgs. 55, 56, 57, 58A, 59, 70, 71, 72A, 77.

1014	Spring	New Usage
2020	#4-48 x 3/16 Fillister Head Screw	New Usage
2057	#6-40 Screw	New Usage
2151	#6-40 Screw (special flat head)	New Usage
2315	#6-40 Screw for Division Stop Lever	
3018	#6-40 x 1/4 Hex. nut	New Usage
4004	Lockwasher	New Usage
4006	Lockwasher	New Usage
4069	Washer	New Usage
4266	Snap Washer	New Usage
4309	Special Washer for Direction Control Slide	New Usage
4319	Snap Washer	New Usage
4322	Snap Washer	New Usage
21250	Right Side Frame Stud Assembly	Replaces 21200**
21252	Counter Carrier Shaft Bearing (right)	Replaces 20044**
21255	Division Stop Lever Assembly	Replaces 21130**
31855	Tabulator Actuator Lever Assembly	Replaces 31855**
31870	Carriage Support Bar Assembly	Replaces 31860**
31880	Division Interrupter Arm Bracket Assembly	New Part
31885	Division Interrupter Arm Assembly	New Part
61420	Division Interrupter Connecting Link	New Part
61485	Division Interrupter Adjusting Link Assembly	New Part
*71605	Shift Gear Bearing Plate Assembly	Replaces 71645**
*71637	Dividend Tab. Key Release Lever	New Usage
*91428	Tabulator Key 9th Position	Replaces 45928**

This feature is now standard on Model ACG and is used on Model CW, STW as a special feature. It can be installed by using the parts listed EXCEPT 21250. Rather than change the existing frame, just file a slot for 31885. Order as AUTOMATIC DIVISION STOP UNIT.

This feature cannot be installed on earlier models having the thin Carriage Support Bar, Page 66.

*=These parts are used only with this feature.

**=These parts remain standard on models not having this feature.

Adjustment

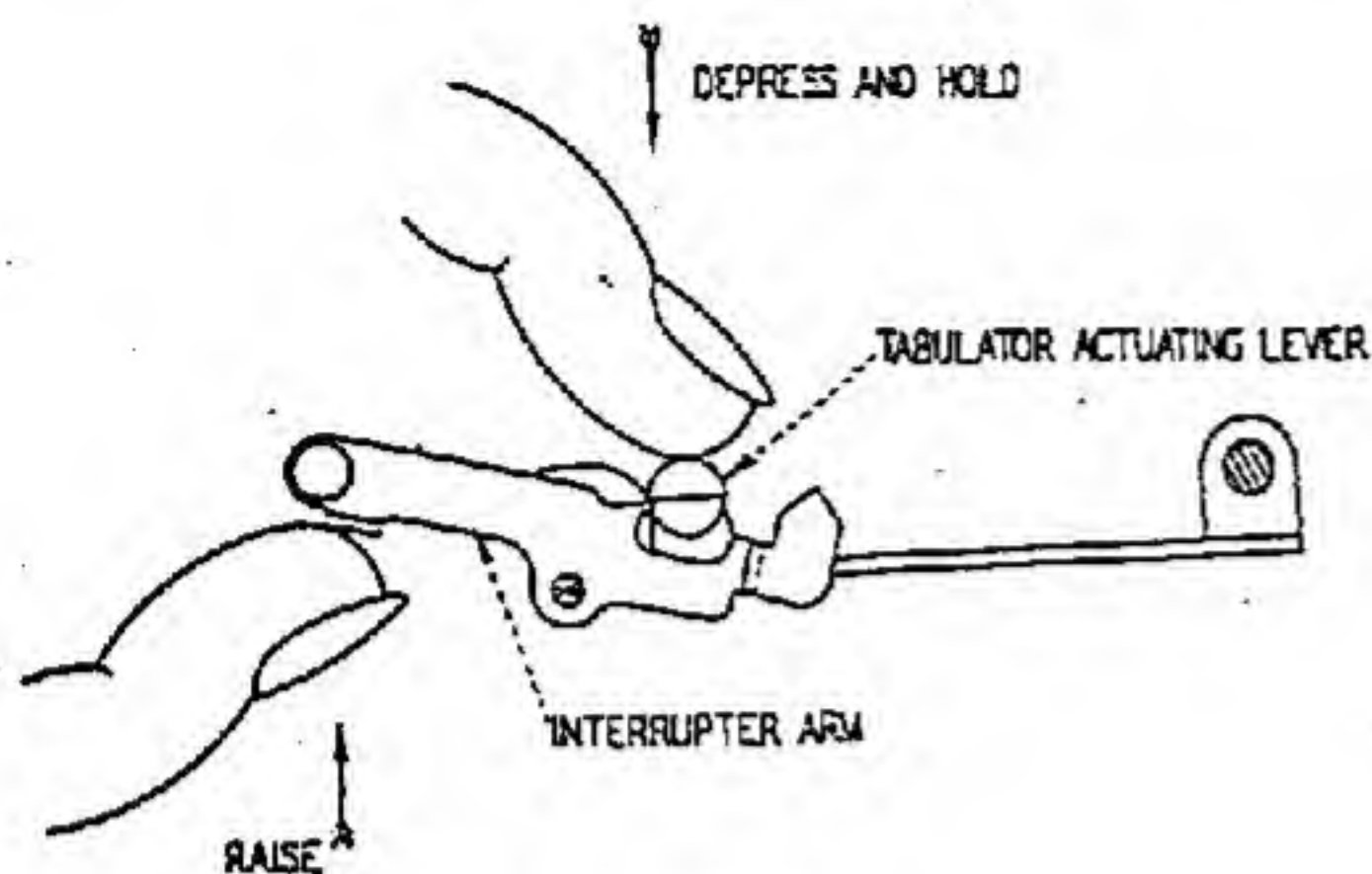


FIG. 1

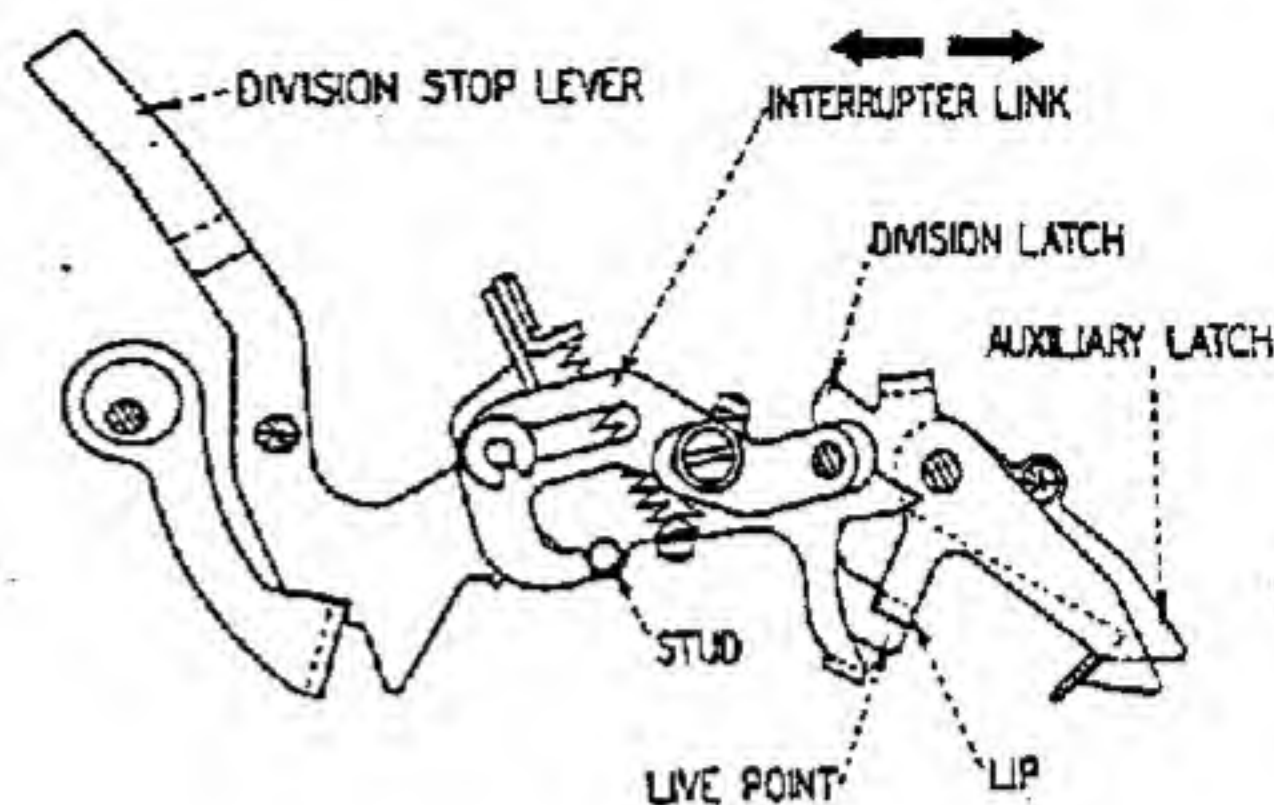
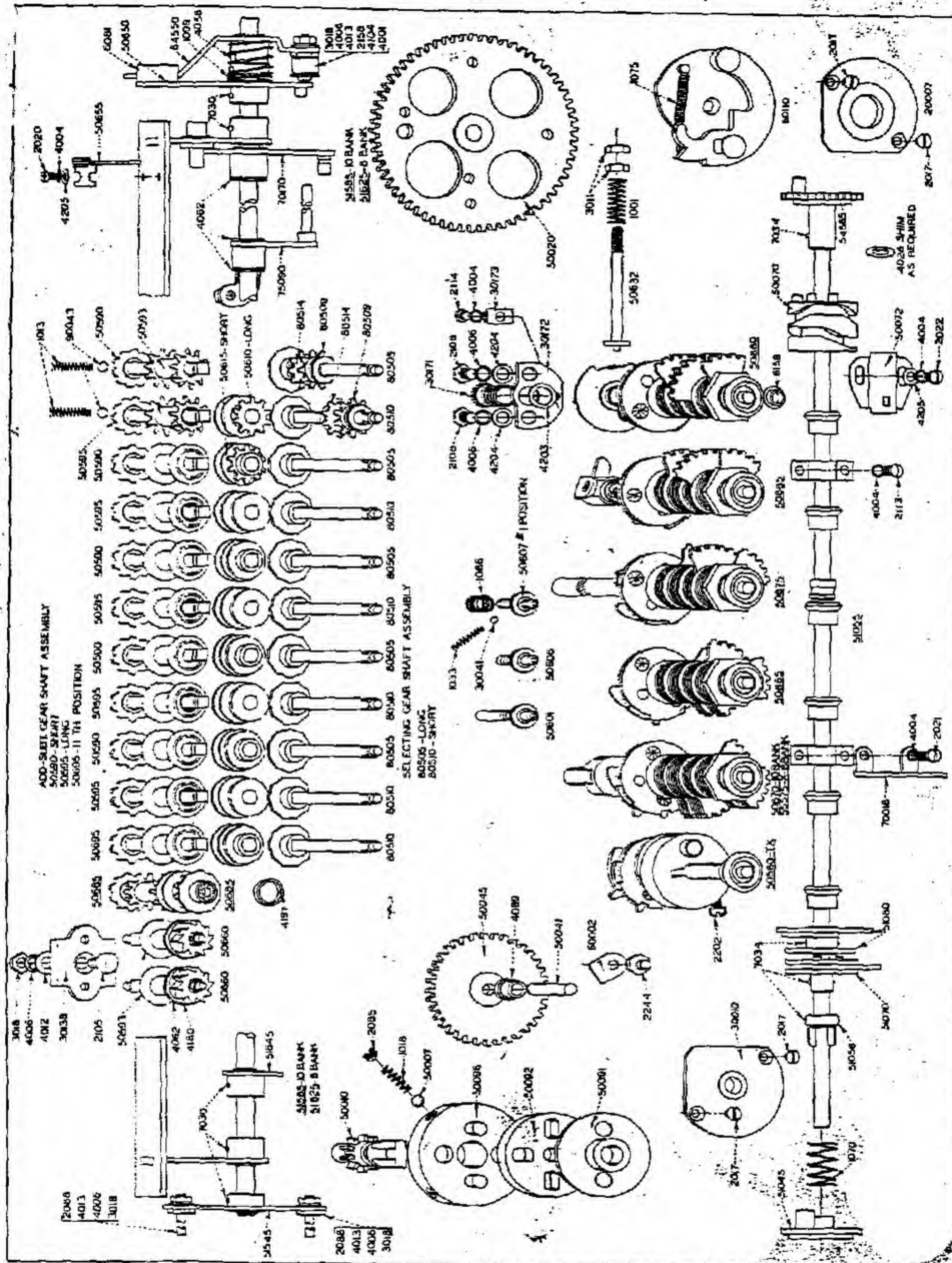


FIG. 2

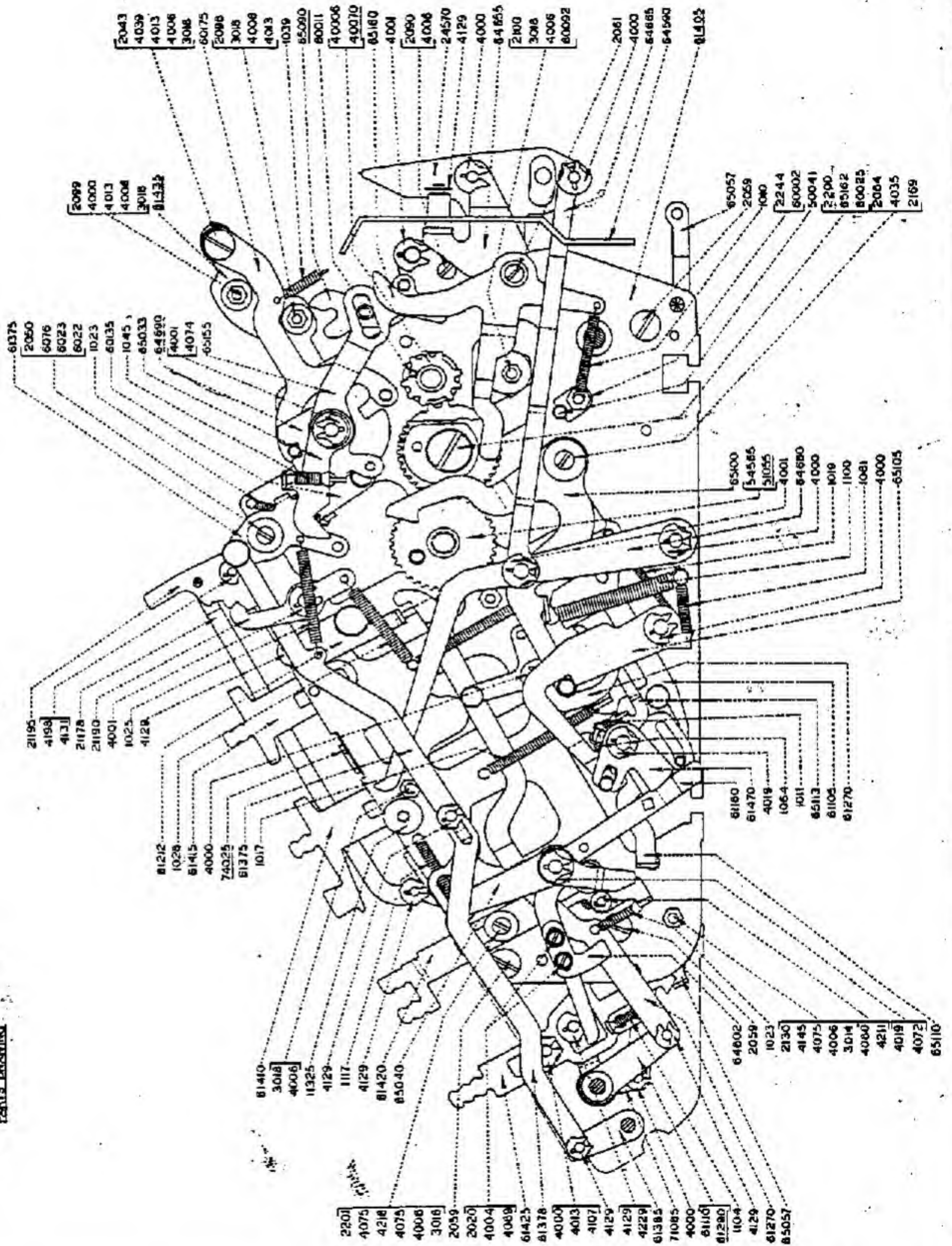
ADJUSTMENT: With the Carriage off, depress the Division Keys and cycle the Drive Shaft by hand until the Auxiliary Latch, Fig. 2, is delatched and the Add - Subtract Gate is back in minus position. Raise the Interrupter Arm; depress and hold the Tabulator Actuating Lever, Fig. 1, so the Interrupter Link, Fig. 2, is in line for a full engagement with the Stud on the Division Stop Lever. Turn the crank slowly to place the Add - Subtract Gate in Add Position. As the Gate is moving to its maximum travel in Add, the Interrupter Link is to actuate the Division Stop Lever to the forward position. This action positions the Live Point up and in front of the Division Latch Lip. Continued cycling of the Drive Shaft will bring the Gate to the neutral position and the Division mechanism will delatch. To adjust for positioning the Division Stop Lever and the Live Point, move the Interrupter Link forward or rearward. Too much rearward adjustment will cause the Division Stop Lever to position before the Gate is in position. This will cause excessive pressure on the parts. Too much forward adjustment will not allow the Division Stop Lever to be positioned. Install the Carriage and test in Division with two Tab Stops depressed.



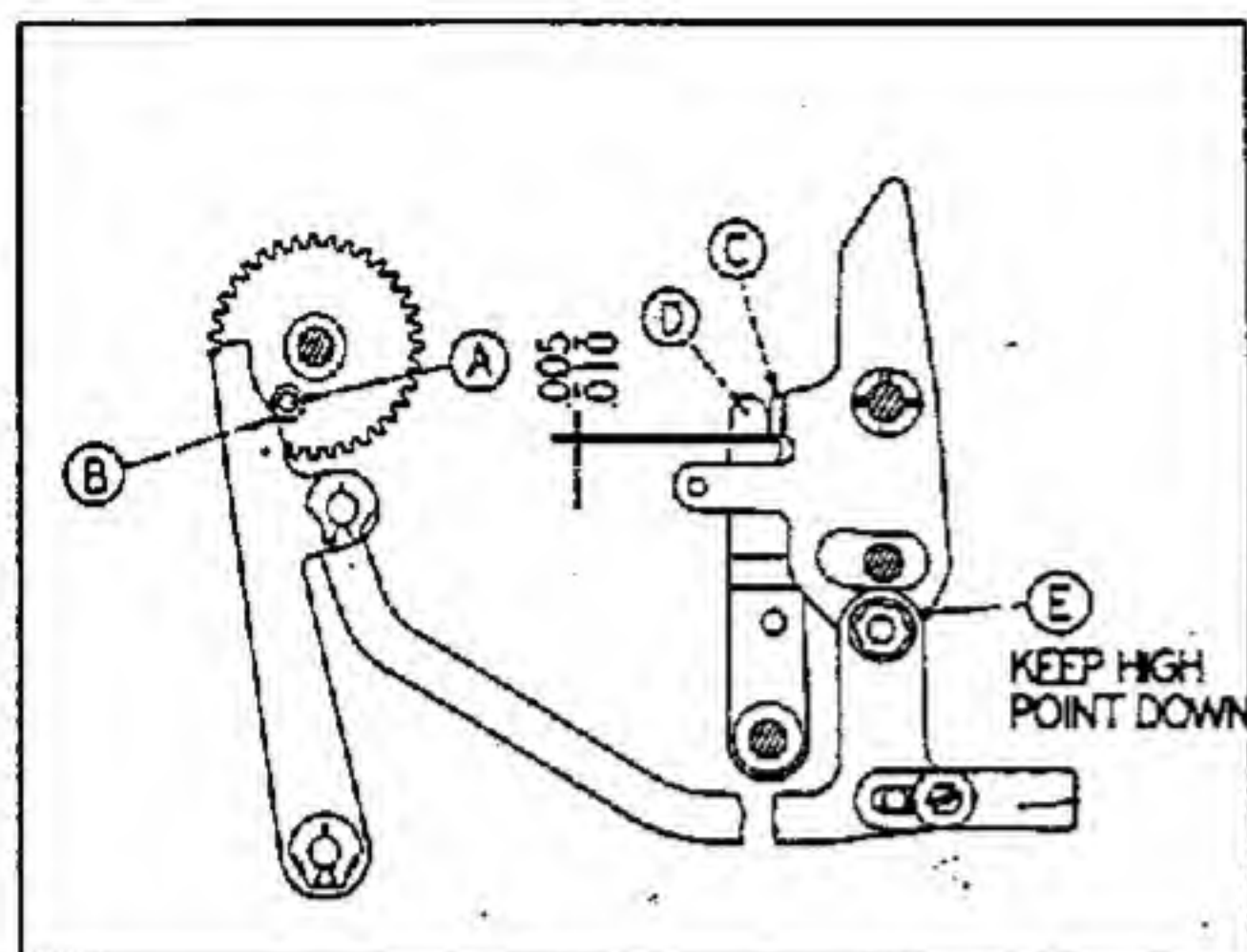
FRIDEN CALCULATING MACHINE CO., INC.

CONTROL PLATE R.H.S.

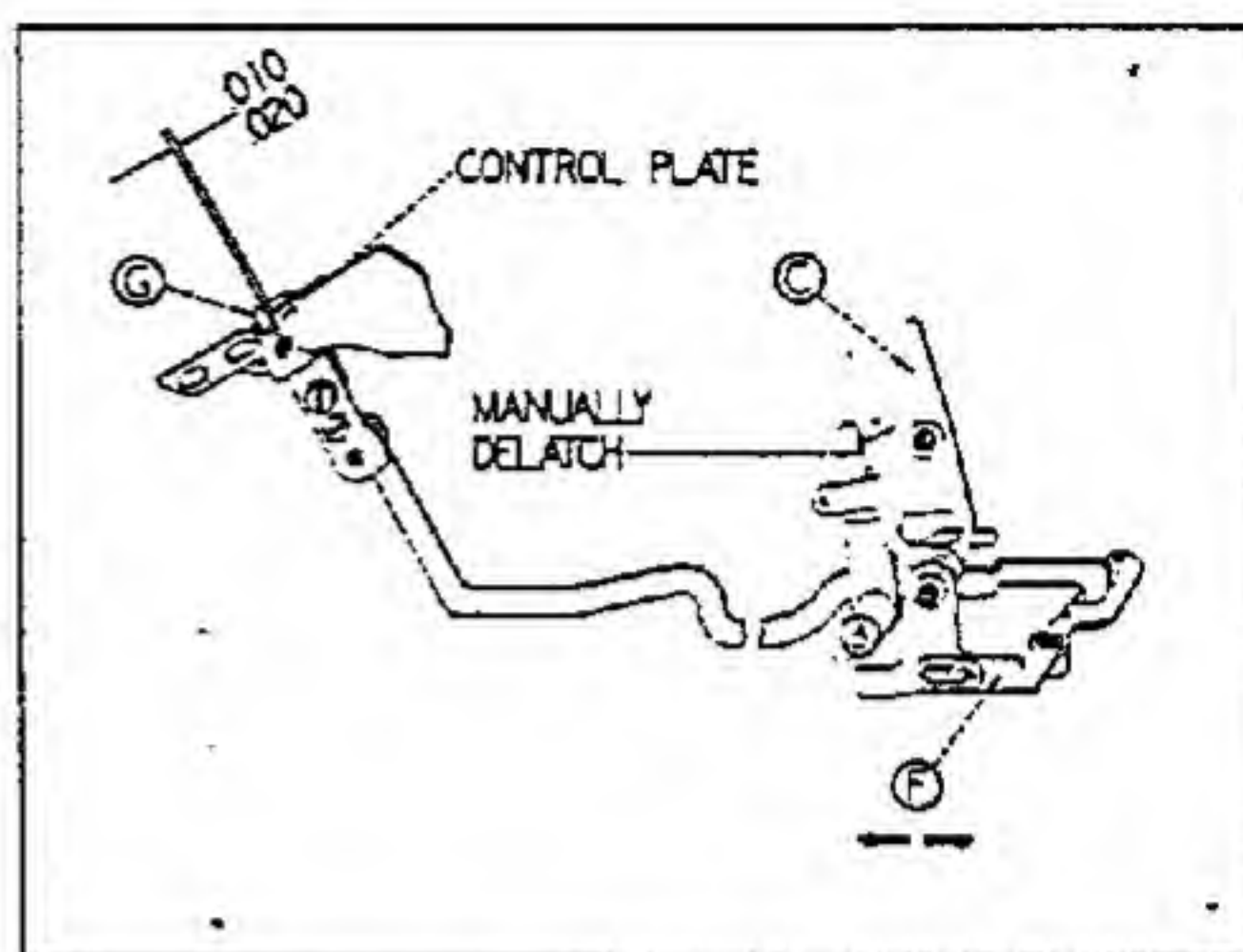
NOTE: ALSO SEE CONTROL PLATE
PARTS DRAWING



TABULATION ADJUSTMENTS

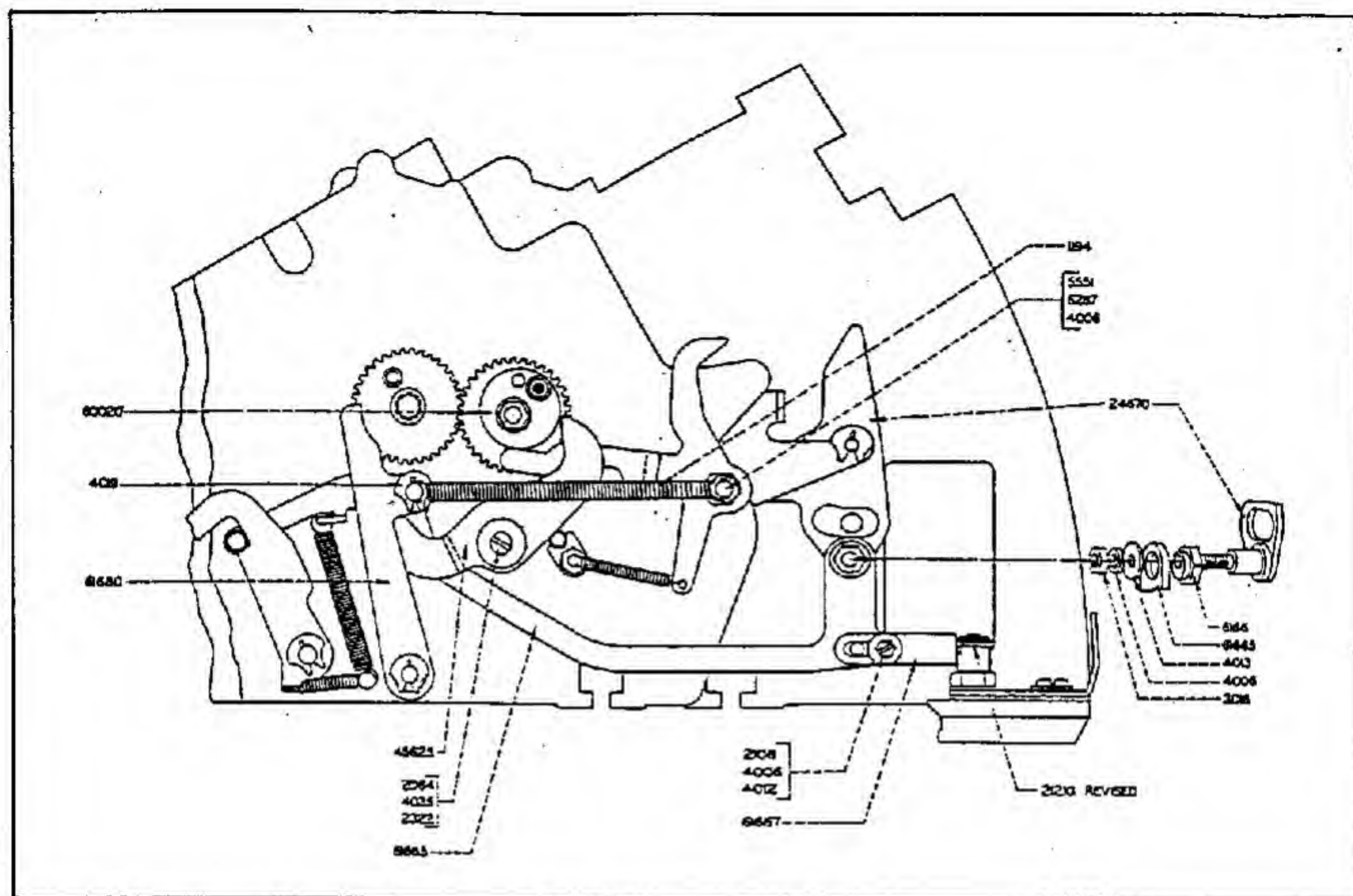


99A. ADD SUBTRACT GATE RELATCH LEVER LINK: When Roller A is on High Point of Lever B, Lever C should have .005 to .010 overlatch on Latch D. Adjust at Eccentric E, keeping high point of Eccentric down.



99B. CLUTCH OPENING ARM: With the machine in Home Position and Keyboard Lock Lever up, manually delatch Lever C so Add-Subtract Gate is fully positioned. Adjust Arm F so there is approximately .010 - .020 clearance between Lever G and the Control Plate. This is to insure that the Clutch remains open at the time of the Add-Subtract Gate actuation and that Lever G does not bottom.

CONTROL PLATE PARTS



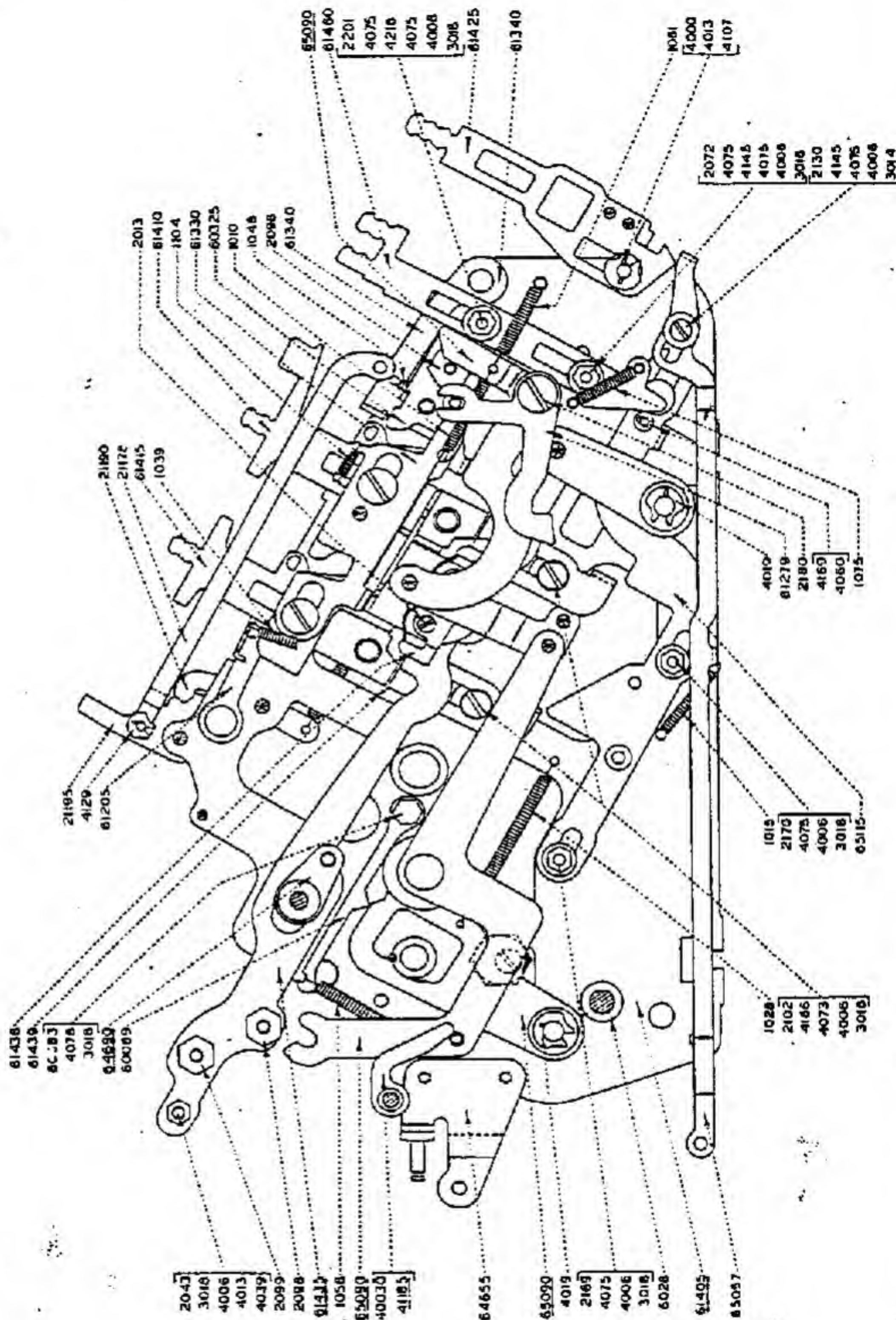
PARTS LIST AND INSTRUCTIONS

KEEP YOUR SERVICE MANUALS UP TO DATE

Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page.

1194	Spring (New Usage)	Replaces 1100 N. INT.
2064	6-32 x 3/16" Fillister Head Screw (NO Change)	
2108	Special Screw (New Usage)	
2322	Special Screw Stud (New Usage)	Replaces 2169 N. INT.
3018	6-40 x 1/4" Hex. Nut (New Usage)	Replaces 4000 N. INT.
4006	#6 Lock Washer (3 New Usages)	
4012	Washer (New Usage)	
4013	Washer (New Usage)	
4019	Snap Washer (New Usage)	Replaces 4001 N. INT.
4035	Washer (No Change)	
5551	Screw Stud (New Part)	Replaces 2100
6166	Eccentric for Add-Sub. Gate Setting Lever (New Part)	
6287	Eccentric for Div. Release Delaying Arm (No Change)	
21210	Micro Switch Booster (Redesigned-Tail Added)	INT.
24670	Add-Sub. Gate Setting Lever (New Parts)	Replaces 24570 N. INT.
45625	Division Setting Lever Assem. (New Usage)	Replaces 61490 N. INT.
60020	Div. Idler Cam and Drive Gear Assem. (New Usage)	Replaces 60025 & 65162 N. INT.
61665	Add-Sub. Gate Relatching Lever Link (New Part)	Replaces 64665 N. INT.
61667	Add-Sub. Gate Relatching Lever Link Arm (New Part)	
61620	Add-Sub. Gate Relatching Lever (New Part)	Replaces 64685 N. INT.

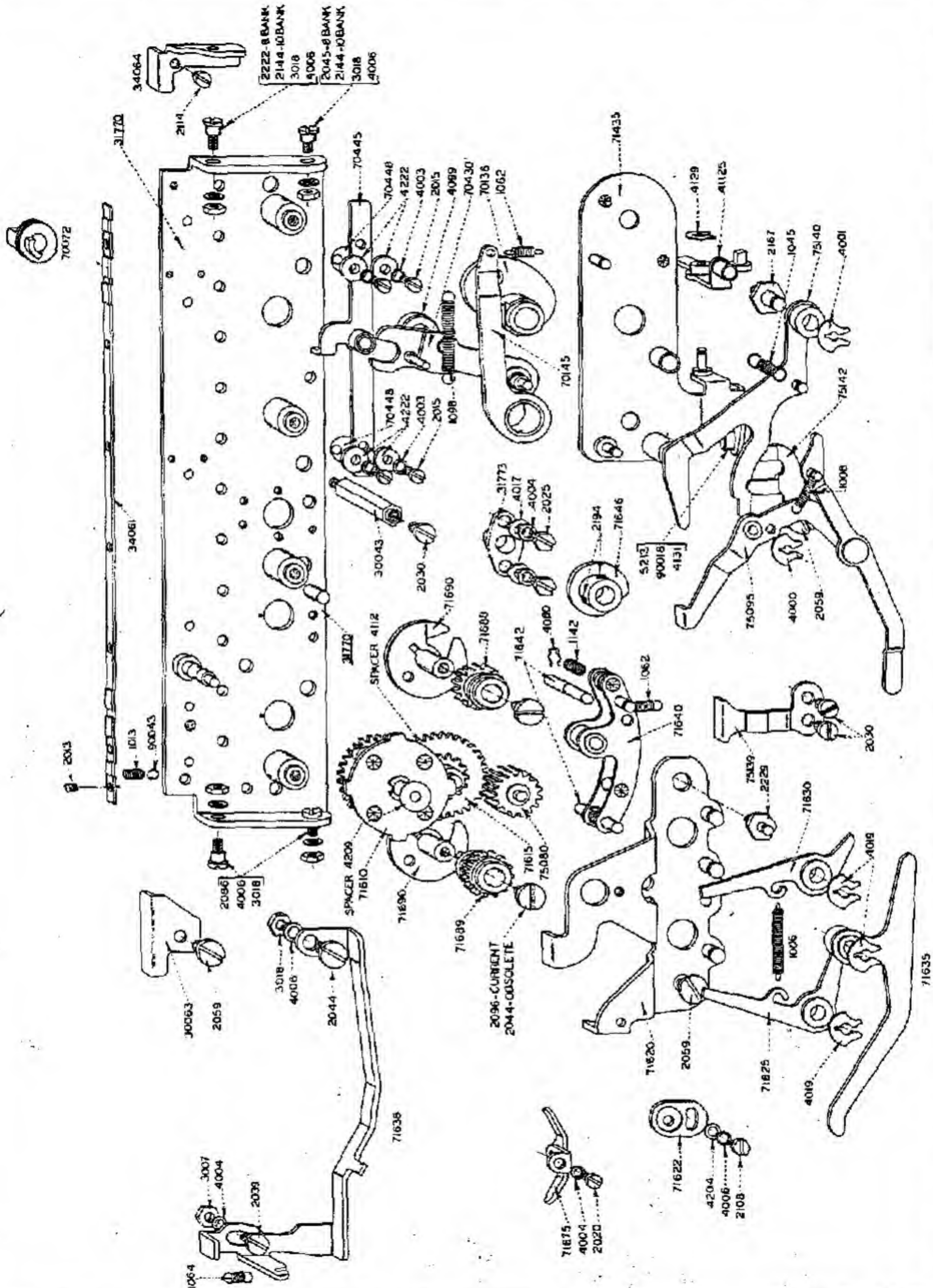
FOR ADJUSTMENTS SEE OTHER SIDE OF PAGE



NOTE: ALSO SEE CONTROL PLATE
PARTS DRAWING

FRIDEN CALCULATING MACHINE CO., INC.
REAR BEARING PLATE

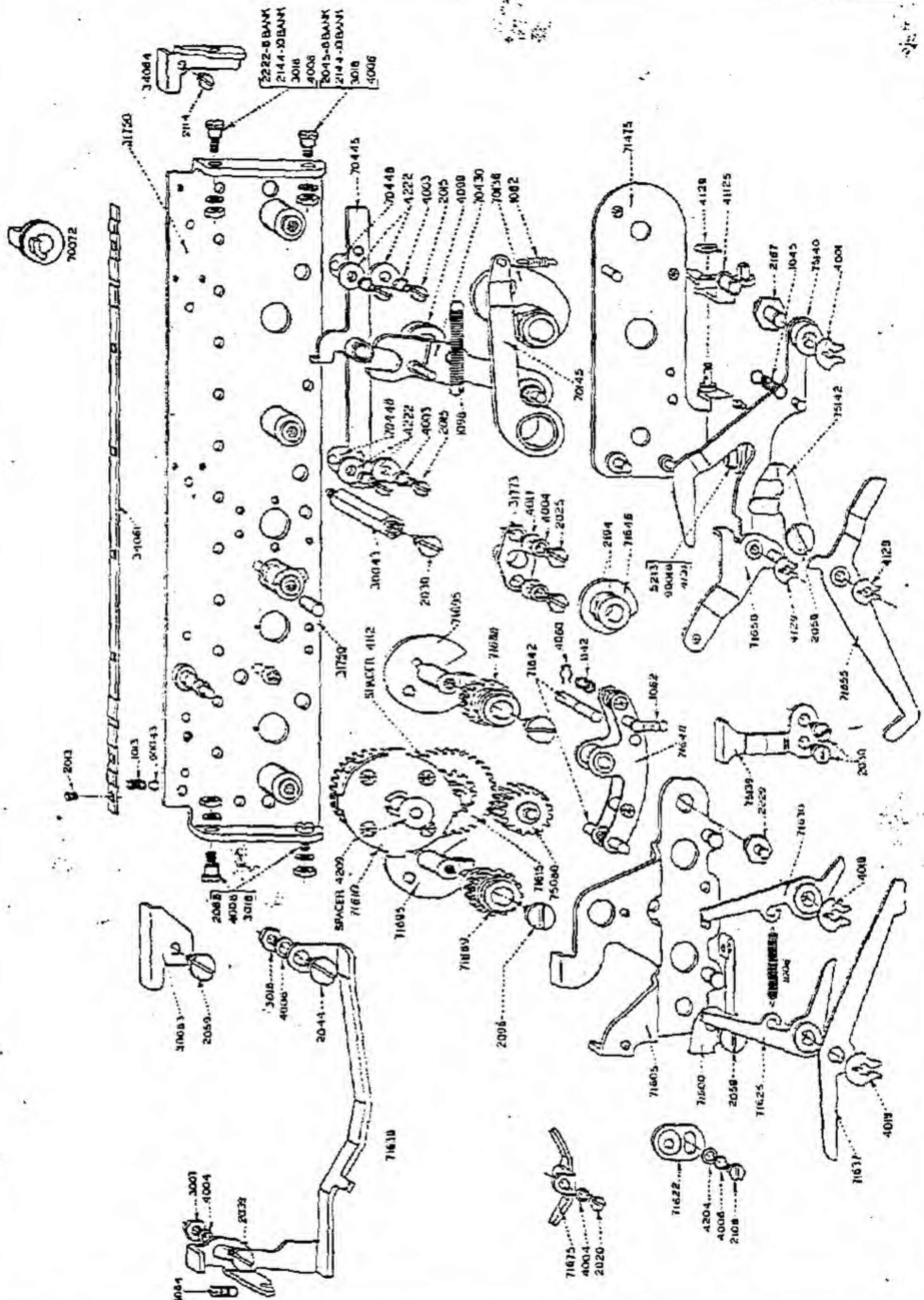
8-15-50



FRIDEN CALCULATING MACHINE CO., INC.
 MODEL STW PARTS LIST

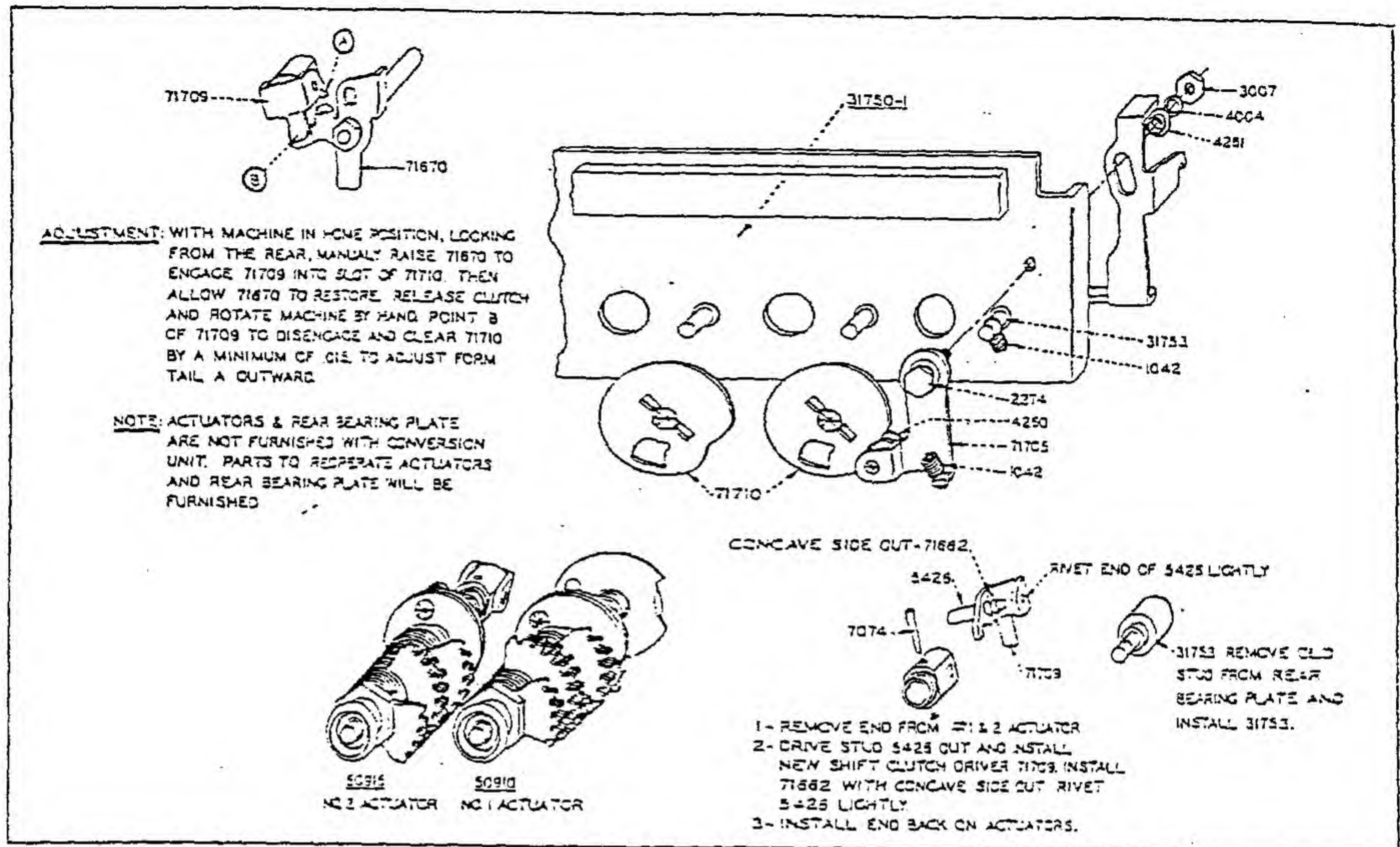
71750	Rear Bearing Plate Assembly	Supersedes 31770
71475	Auto. Clear Cam Bearing Plate Assembly	Supersedes 71435
71600	Shift Gear Train Detent Spring Assembly	New Part
71605	Shift Gear Bearing Plate Assembly	Supersedes 71620
71637	Tabulator Key Release Lever	Supersedes 71635
71650	Right Shift Disabling Bell Crank Assembly	Supersedes 75095
71655	Shift Disabling Lever - Right	Supersedes 75095
71695	Shift Clutch Follower Assembly	Supersedes 71690

MODEL STW



FRIDEN CALCULATING MACHINE CO., INC.

SHIFT CENTRALIZER PARTS



PARTS LIST AND INSTRUCTIONS

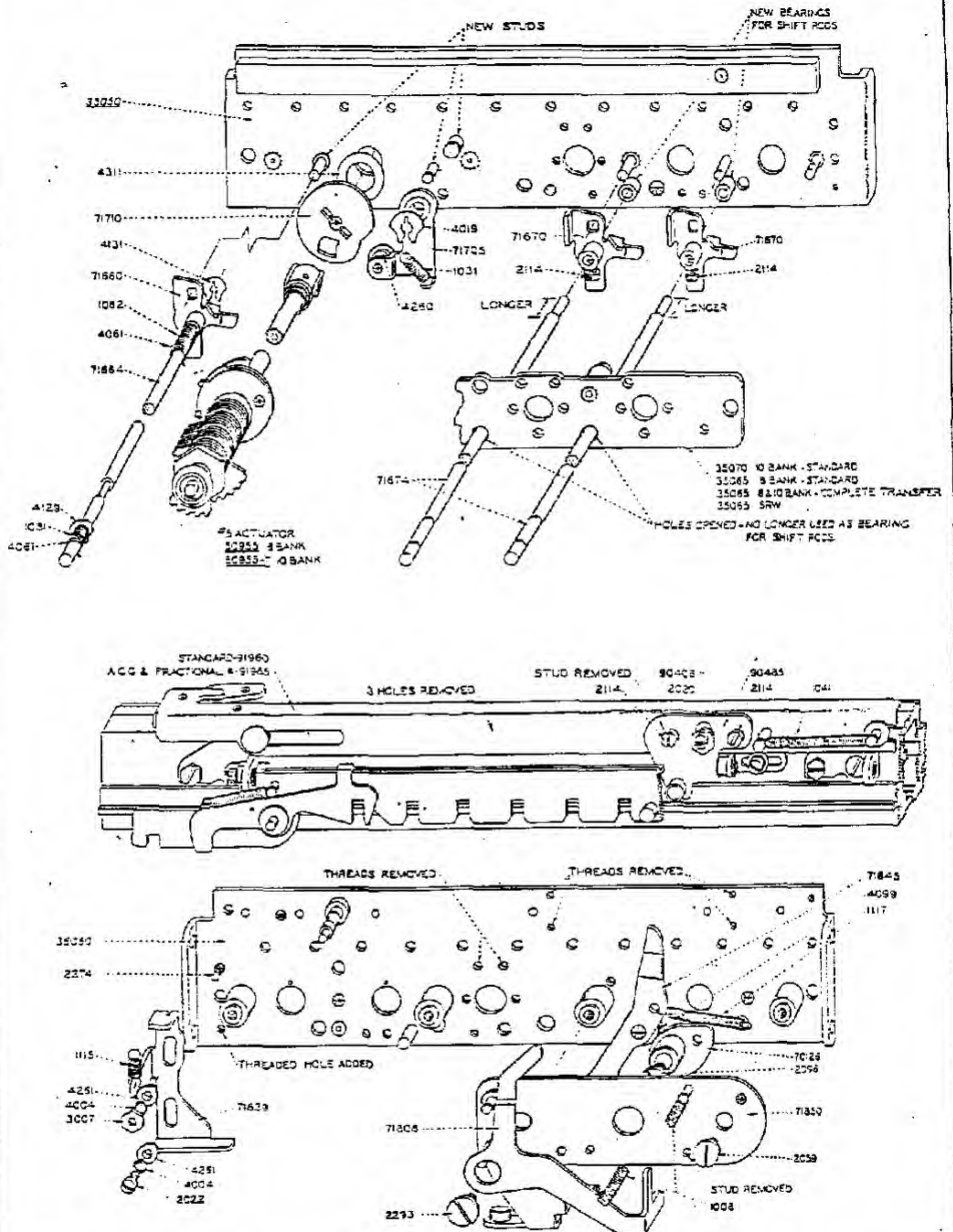
KEEP YOUR SERVICE MANUALS UP TO DATE

Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page.

1042	Spring - New Usage.	
2274	Pivot Screw - Shift Centralizer - New Part.	
3007	4-48 x 1/4 Hex Nut.	
4004	#4 Lock Washer.	
4250	Shift Disc Centralizer Roller - New Part.	
4251	Guide Spacer for Auto. Clear Dis. Slide - New Part.	
5425	Pivot Stud for Shift Clutch Driver.	
* 31750-1	Rear Bearing Plate Assembly - Revised.	
31753	Stud for Shift Gear Bearing Plate - Right.	Replaces 30057
* 50910	Number One Actuator Assembly.	Replaces 50880
* 50915	Number Two Actuator Assembly.	Replaces 50885
71662	Shift Clutch Driver Friction Spring.	
71705	Shift Disc Centralizer Arm Assembly - New Part.	
71709	Shift Clutch Driver.	Replaces 71661
71710	Centralizing Shift Disc Assembly.	Replaces 71695

Parts identified by a Star are not to be included in the SHIFT CENTRALIZER CONVERSION UNIT.

NOTE: When ordering these parts for converting older machines, order by the name SHIFT CENTRALIZER CONVERSION UNIT. This way the parts will be sent to you at no charge for a limited time only. The SMOOTH SHIFT CONVERSION UNIT has also been revised to include these parts so it will not be necessary to order both units to convert to Smooth Shift with the Centralizer.

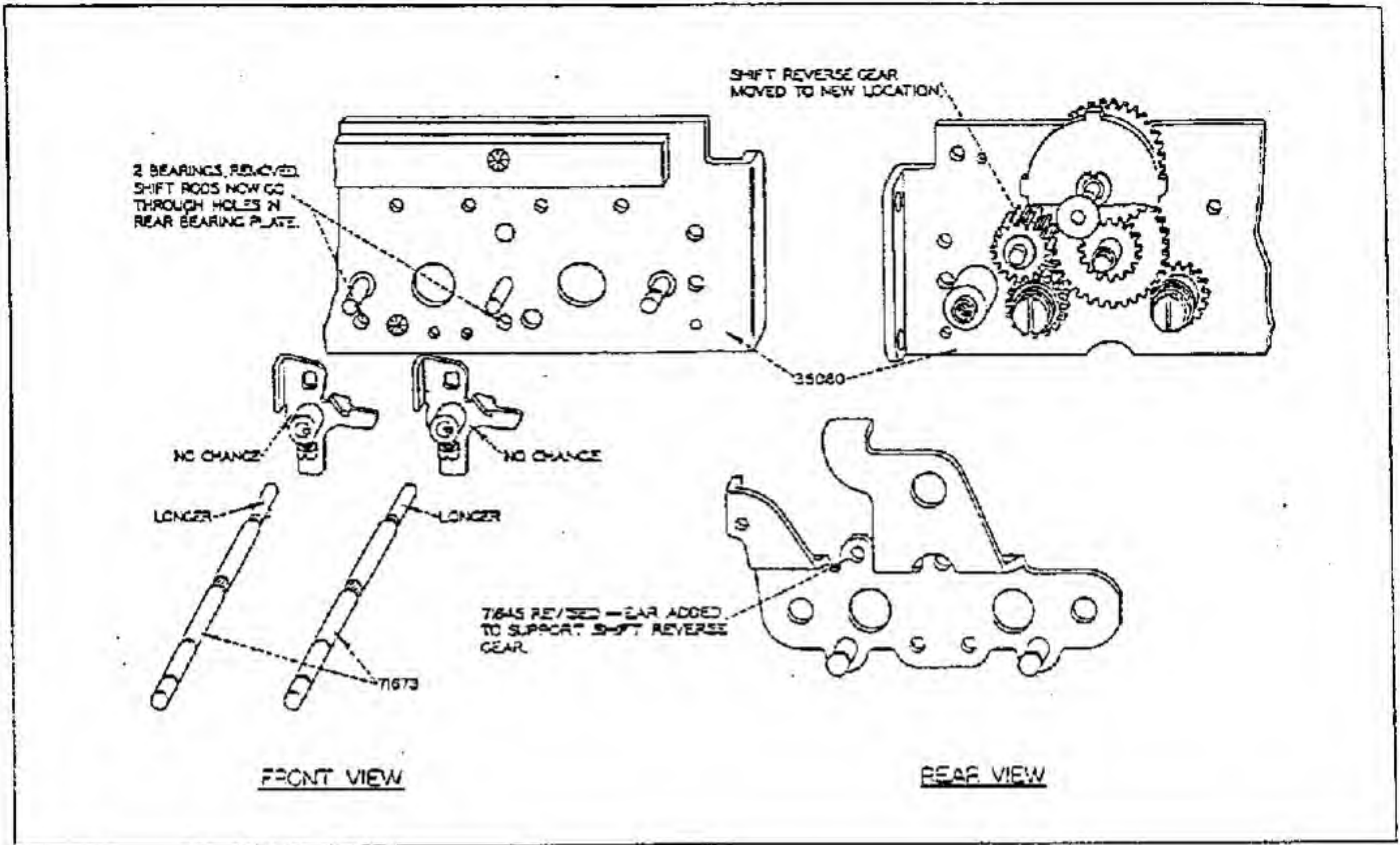


REAR BEARING PLATE

1008	Spring.- New Usage.	Replaces 1045
1031	Spring.- New Usage.	
1041	Spring.- No Change.	
1081	Spring.- No Change.	
1082	Spring.- No Change.	
1115	Spring.- New Usage.	Replaces 1064
1117	Spring.- New Usage.	Replaces 1098
2020	4-48 x 3/16" Fillister Head Screw.	
2022	4-48 x 1/4" Fillister Head Screw.- New Usage.	Replaces 2044
2059	6-32 x 9/32" Special Screw.- New Usage.	Replaces 2167
2096	Special Screw, 6-40 Thread.- New Usage.	
2114	4-48 x .130 Fillister Head Screw.	
2274	Pivot Screw - Shift Centralizer.- No Change.	
2293	Special Screw - 6-32 Thread.- New Part.	Replaces 2059
3007	4-48 x 1/4" Hex Nut.- No Change.	
4004	#4 Lockwasher.- New Usage.	Replaces 4006
4019	Snap Washer.- New Usage.	
4061	Spring Clip.- No Change.	
4099	Roller for Auto.-Clear Cam Lever Assem.- No Change.	
4129	Snap Washer.- No Change.	
4131	Snap Washer.- New Usage.	Replaces 4060
4160	Shift Disc Centralizer Roller.- New Usage.	
4261	Guide Spacer for Auto.-Clear Disengaging Slide.- New Usage.	
4311	Spacer for Centralizing Shift Disc.- New Part.	
<u>35050</u>	Rear Bearing Plate Assembly.- New Part.	Replaces 31750
<u>35055</u>	Bearing and Guide Plate Assem. 8 Bank and Comp. Trans.- New Part.	Replaces 31795
35070	Bearing and Guide Plate Assem. 10 Bank Standard.- New Part.	Replaces 31790
50955	#5 Actuator Assembly - 8 Bank.- New Part.	Replaces 50950
<u>50955-T</u>	#5 Actuator Assembly - 10 Bank.- New Part.	Replaces 50950-T
70126	Cam for Automatic Clear.- New Part.	Replaces 70136
71639	Auto.-Clear Disengaging Slide.- New Part.	Replaces 71638
71660	Auto.-Clear Clutch Controller Assembly.- New Part.	Replaces 75130
71664	Auto.-Clear Rod.- New Part.	Replaces 75137
71670	Shift Clutch Controller Assembly.- Revised.	
71674	Shift Rod.- New Part.	Replaces 71672
71705	Shift Disc Centralizer Arm Assembly.- New Usage.	
71710	Centralizing Shift Disc Assembly.- New Usage.	
71808	Auto.-Clear Clutch Engaging Lever.- New Part.	Replaces 75140
71845	Auto.-Clear Arm Assembly.- New Part.	Replaces 70425
71850	Auto.-Clear Cam Bearing Plate Assembly.- New Part.	Replaces 71475
90406	Optional Clear Slide Eccentric.	
90485	Auto.-Clear Bracket Assembly.- New Part.	Replaces 90488
91960	Optional Clear Slide Assem.-Standard.- New Part.	Replaces 91660
91965	Optional Clear Slide Assem.-Fractional & and ACG.- New Part.	Replaces 91875

INSERT IN YOUR SERVICE MANUAL

REAR BEARING PLATE



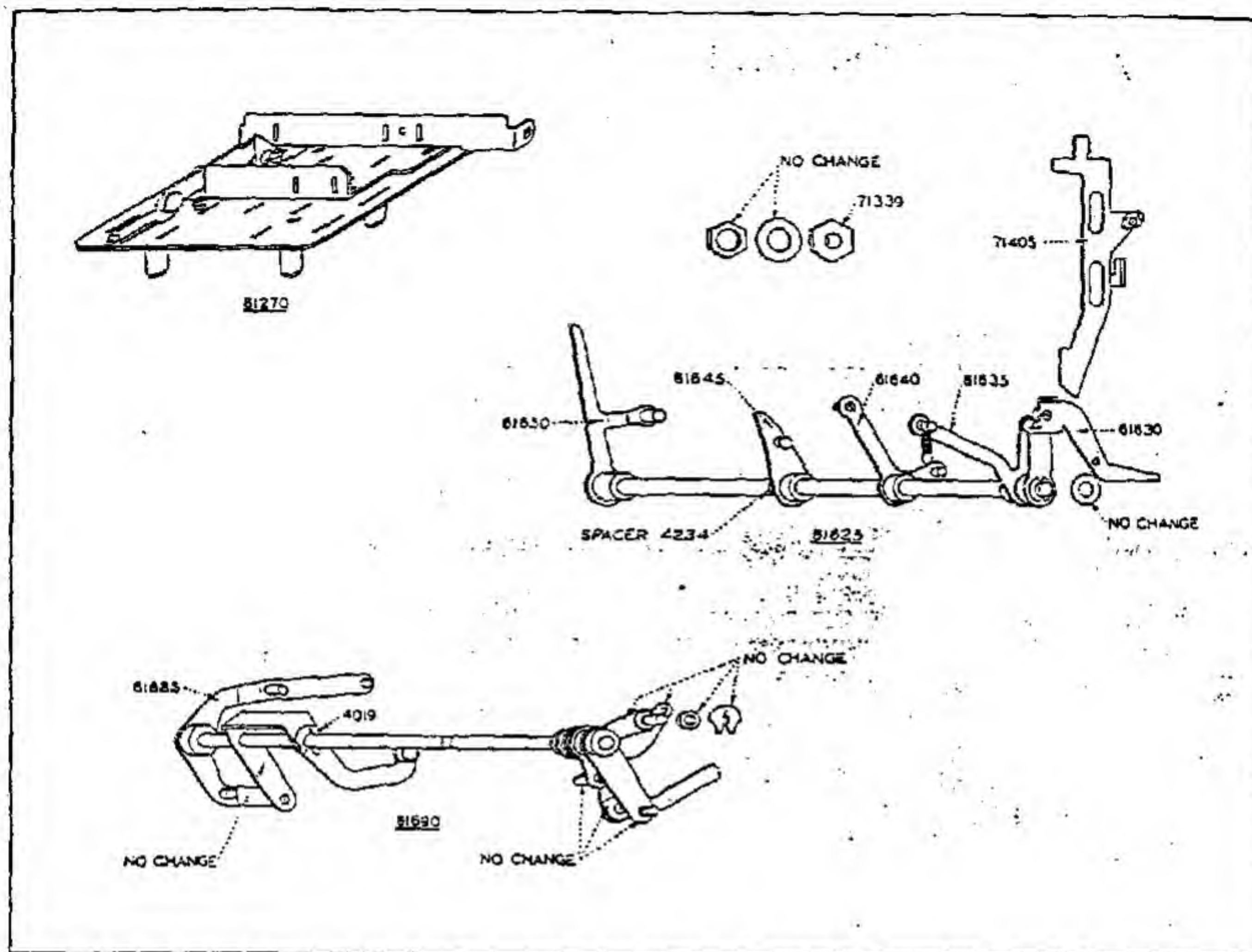
PARTS LIST AND INSTRUCTIONS

KEEP YOUR SERVICE MANUAL UP TO DATE

Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page.

35080: Rear Bearing Plate. 2 bearings for Shift Rods replaced by holes. Also changed location of hole for Shift Reverse Gear 75080.	Replaces 35050	N. INT.
71673: Shift Rods. Ends made long enough to go through Rear Bearing Plate.	Replaces 71674	N. INT.
71645: Shift Gear Bearing Plate. Revised; Lug added to support Shift Reverse Gear 75080 in new position.		INT.

The position of the Shift Reverse Gear was changed to allow the Shift Rods to come through the Rear Bearing Plate, thus eliminating the necessity for having the riveted bearing on the Rear Bearing Plate to support the ends of the Shift Rods. This provides a better method of manufacture and eliminates the possibility of the Shift Rod binding in the bearing.



PARTS LIST AND INSTRUCTIONS

KEEP YOUR SERVICE MANUAL UP TO DATE

Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page.

4019	Snap Washer - Replaces Spacers 4127 & 4183 on <u>61690</u> Shaft.		
<u>61625</u>	Clutch Control Shaft & Levers Assembly	Replaces <u>61325</u>	N.INT.
61630	Control Shaft Oscillating Lever Assem.	" 61305	N.INT.
61635	Switch Opening Lever Assembly	" 61350	N.INT.
61640	Shift Actuating Lever Control Lever Assem.	" 61345	N.INT.
61645	Mult. Key Clutch Opener Lever Assembly	" 61315	N.INT.
61685	Interlock Operating Lever Assembly	" 31590	N.INT.
<u>61690</u>	Interlock Operating Shaft Assembly	" <u>61290</u>	N.INT.
71339	Bearing for Control Shaft	" 71338	N.INT.
71405	Shift Key Assembly - Right	" 71410	N.INT.
<u>81270</u>	Top Plate Assembly	" <u>81250</u>	N.INT.

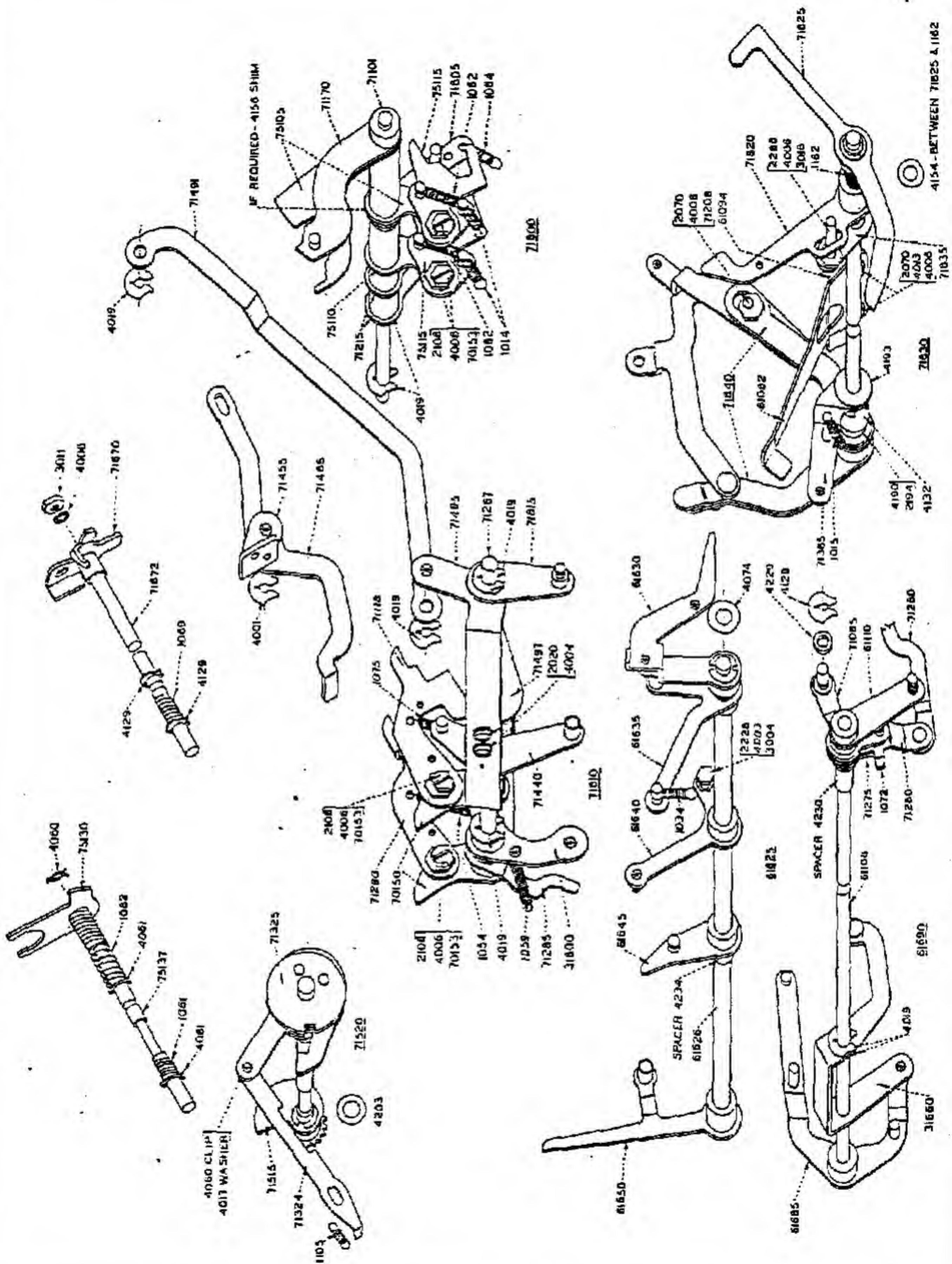
NOTE: No Adjustments affected by the changes on this page.

NOTE 2: See page 64-A for other parts and instructions connected with these changes.

N.INT. Not Interchangeable with the part it replaces.

INSERT IN YOUR STW SERVICE MANUAL FACING PAGE 73

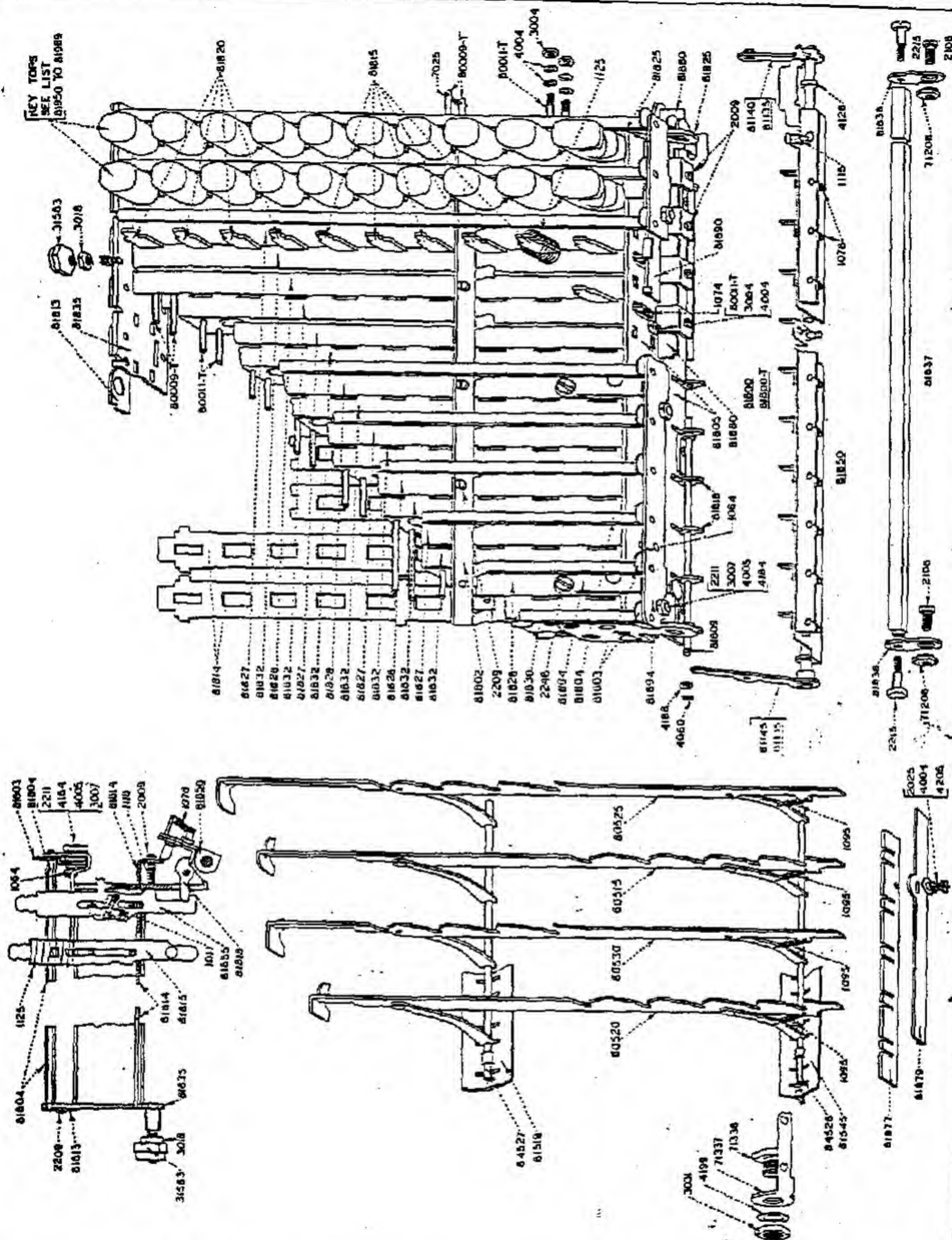
MAIN SHAFTS & SHIFT PARTS



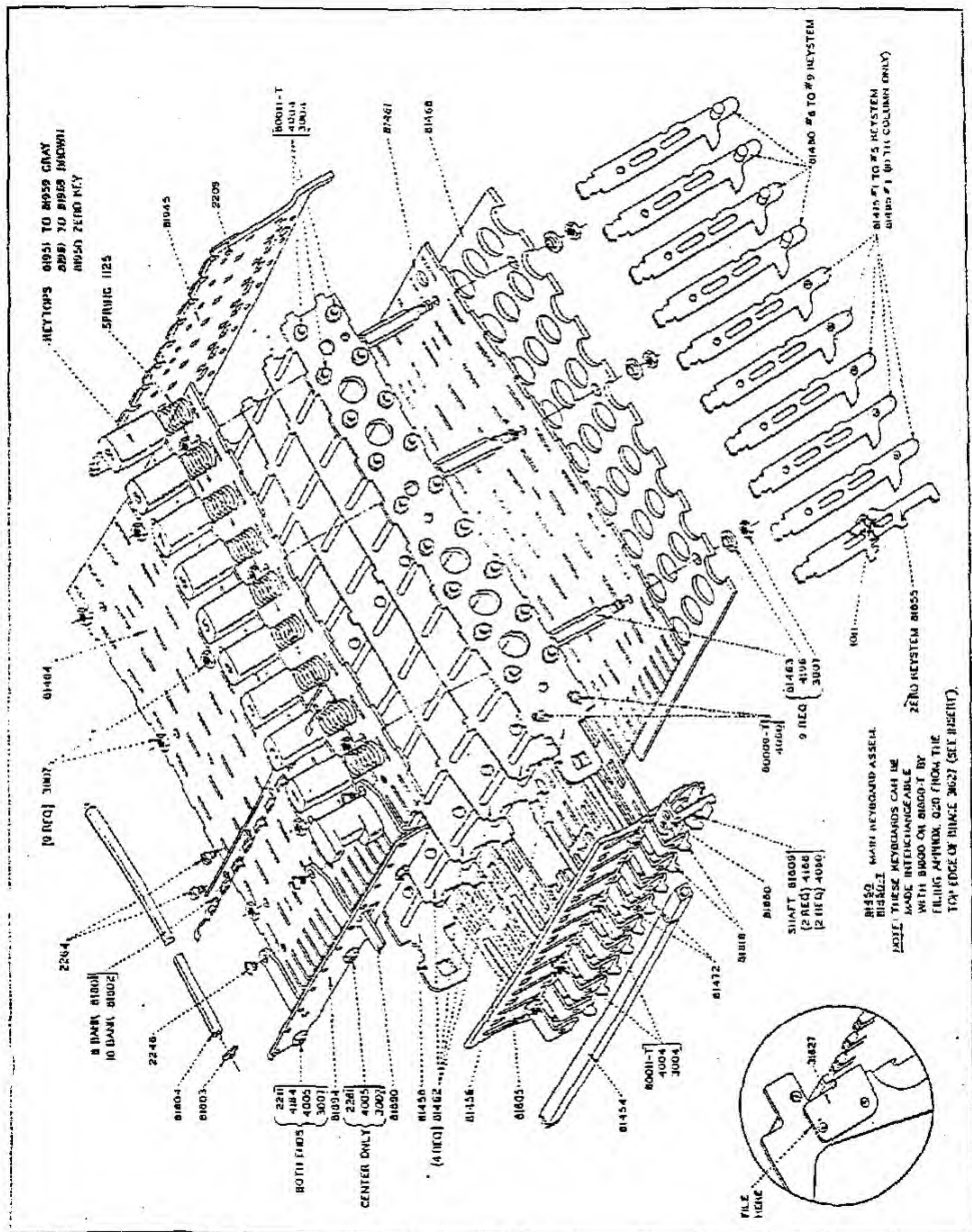
PARTS LIST

(Only parts changed from those on Page 73 & 73 A listed)

1162	Spring.	Replaces 1056
2286	5-40 Special Screw Stud.	Replaces 2236
4154	Spacer.	New Usage
4203	Thrust Washer.	Replaces 4026
71670	Shift Clutch Controller Assembly.	Replaces 71681
71672	Shift Rod.	Replaces 71682
71800	Shift Actuating Shaft Assembly.	Replaces <u>75100</u>
71101	Shift Actuating Lever Shaft.	
71170	Actuating Lever for Left Shift Assembly.	
71215	Return Clear Shift Opening Assembly.	
71805	Shift Rod Actuating Lever Assembly.	
75105	Right Shift Lever Assembly.	
75110	Shift Engaging Link Actuating Lever Assembly.	
4152	Spacer.	
4156	Shim.	
7033	6/0 X 1/2" Taper Pin.	
71805	Shift Rod Actuating Lever Assembly.	Replaces 71110
71810	Automatic Clear Levers and Shaft Assembly.	Replaces <u>71490</u>
31600	Power Set Shift Latch Actuating Lever Assembly.	
70150	Clear Clutch Engaging Lever Assembly.	
71267	Auto. Clear Lever Shaft.	
71285	Clear Disabling Lever Assembly.	
71440	Shift Shaft Oscillating Lever Assembly.	
71495	Auto. Clear & Shift Disengaging Bail Assembly.	
71815	Auto. Clear Lever Assembly.	
4019	Snap Washer.	
7033	6/0 X 1/2" Taper Pin.	
71815	Automatic Clear Lever Assembly.	Replaces 71350
71320	Multiplier Unit Shift Control Arm Assembly.	Replaces 71400
71825	Shift Setup Latch Control Lever Assembly.	Replaces 24590
71830	Carriage Shift Shaft Assembly.	Replaces <u>71380</u>
71831	Carriage Shift Throwout Shaft.	
71835	Carriage Shift Throwout Arm Assembly.	
71840	Power Set Latch Release Lever Assembly.	
2286	5-40 Special Screw Stud.	
3011	5-40 X 1/4" Hex. Nut.	
4006	#6 Lock Washer.	
4132	Collar.	
4190	Collar.	
7033	6/0 X 1/2" Taper Pin.	
71835	Carriage Shift Throwout Arm Assembly.	Replaces 71355
71840	Power Set Latch Release Lever Assembly.	Replaces 71240



KEY SECTION



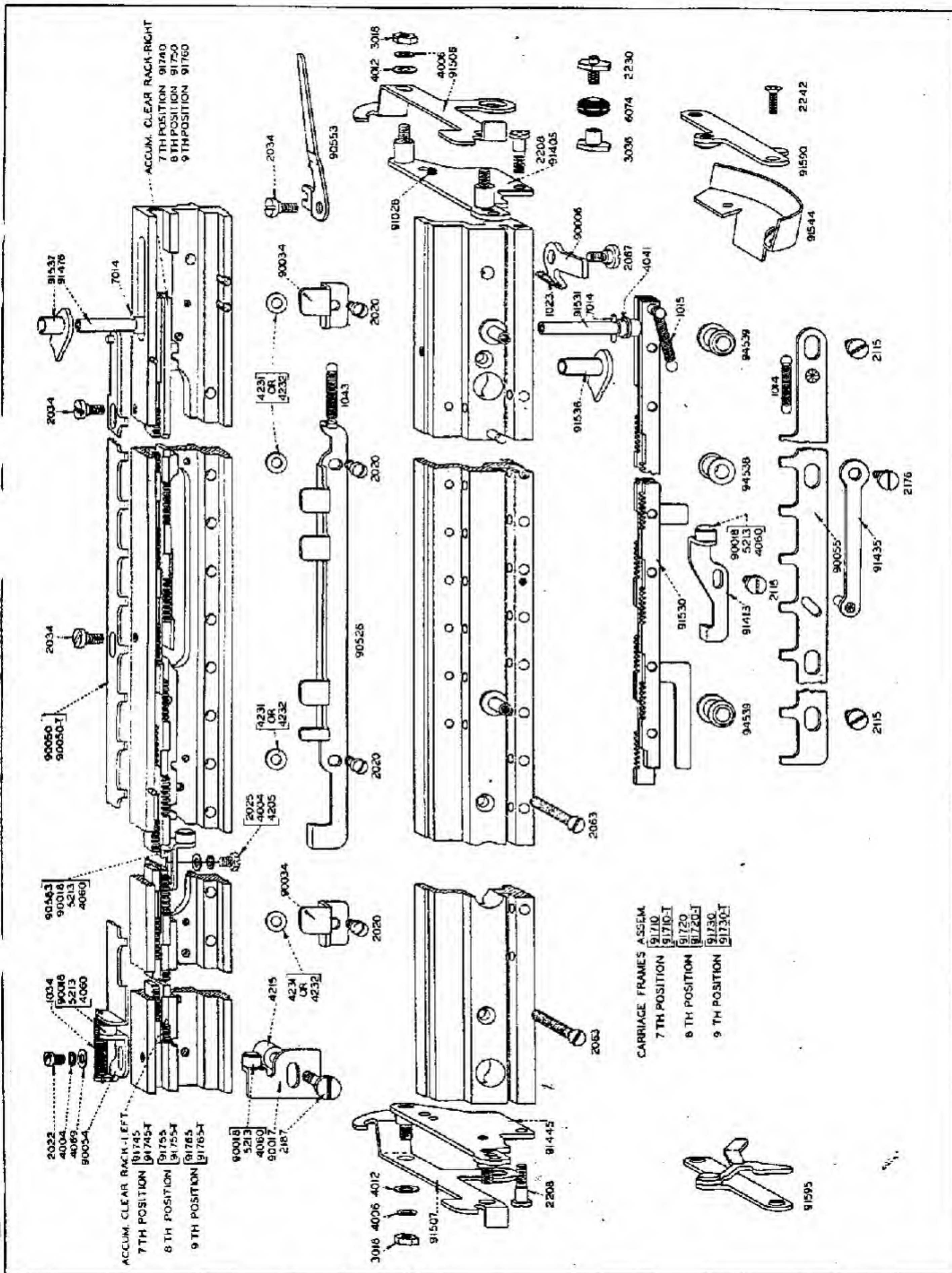
PARTS LIST

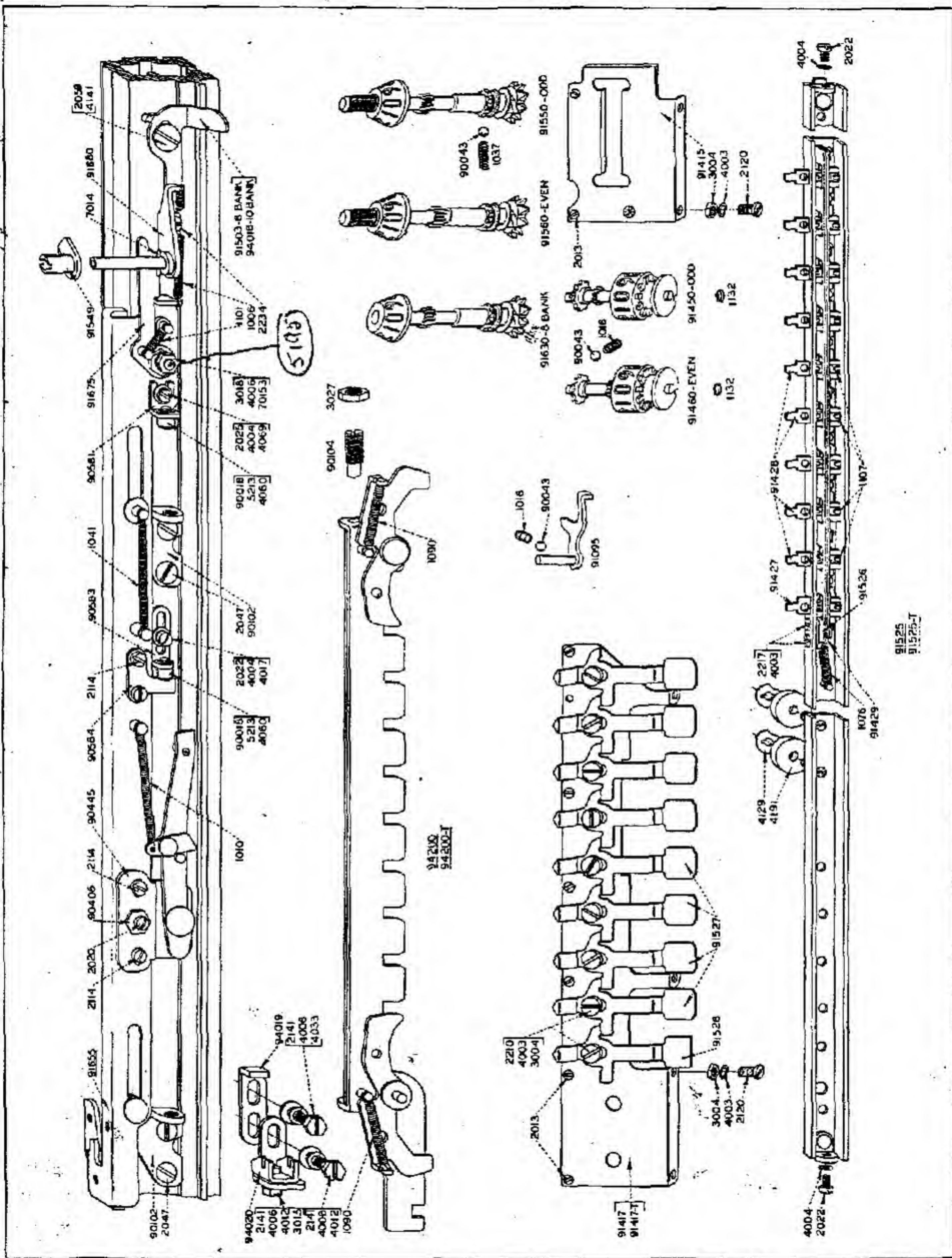
1011	Spring - no change.	
1125	Spring - no change.	
2209	3-48 x 1/8 Round Head Screw - no change.	
2211	4-48 Special Screw - no change.	
2246	4-48 x 1/8 Round Head Screw - no change.	
2261	4-48 Special Screw - no change.	
2264	3-48 x 1/8 Fillister Head Screw - no change.	
3004	3-48 x 3/16 Hex. Nut - larger usage.	
3007	4-48 x 1/4 Hex. Nut - new usage.	
4004	#4 Lock Washer - larger usage.	
4005	#4 Special Lock Washer - no change.	
4060	Spring Clip - less usage.	
4184	Spacer - no change.	
4188	Spacer - no change.	
4196	Spacer - new usage.	
80009-T	Guide Rod for Key Section - less usage.	
80011-T	Guide Rod for Key Section-Threaded - larger usage.	
81450	Main Keyboard Assembly - 8 Bank - (see Note)	Replaces 81800 *
81450-T	Main Keyboard Assembly - 10 Bank - (see Note)	Replaces 81800-T *
81454	Keyboard Support Bar (Front) - new part	Replaces 81837 *
81456	Keyboard Side Frame - Right - new part.	
81458	Keyboard Side Frame - Left - new part.	
81461	Keyboard Bottom Plate - new part.	
81462	Keyboard Separator Plate - new part.	
81463	Keyboard Spacer Post - new part.	
81464	Keyboard Top Plate - new part.	
81468	Pad - Keyboard Bottom Plate - new part.	
81472	Key Lock Bar - new part	Replaces 81814 *
81475	Numeral Key Stem Assembly #1 to #5 - new part	Replaces 81815 *
81480	Numeral Key Stem Assembly #6 to #9 - new part	Replaces 81820 *
81485	#1 Tenth Column Numeral Key Stem Assembly - new part.	Replaces 81990 *
81801	Decimal Marker Bar Spring (8 Bank) - no change.	
81802	Decimal Marker Bar Spring (10 Bank) - no change.	
81803	Decimal Marker Bar Twirler - no change.	
81804	Keyboard Decimal Marker Bar - no change.	
81805	Front Key Section Support Assembly - revised	Interchangeable
81809	Keyboard Clear Disabling Lever Shaft - no change.	
81818	Keyboard Clear Disabling Lever - no change.	
81855	Zero Key Stem Assembly - no change.	
81880	Keyboard Lock Bar Assembly - no change.	
81890	Decimal Marker Restore Lever Assembly - no change.	
81894	Decimal Marker Support Bracket (Front) - no change.	
81945	Rear Key Section Support Assembly - revised	Interchangeable
81950	Zero and Keyboard Lock Key Top - no change.	
81951 } to } 81959 }	#1 to #9 Key Top - Gray - no change.	
81961 } to } 81969 }	#1 to #9 Key Top - Brown - no change.	

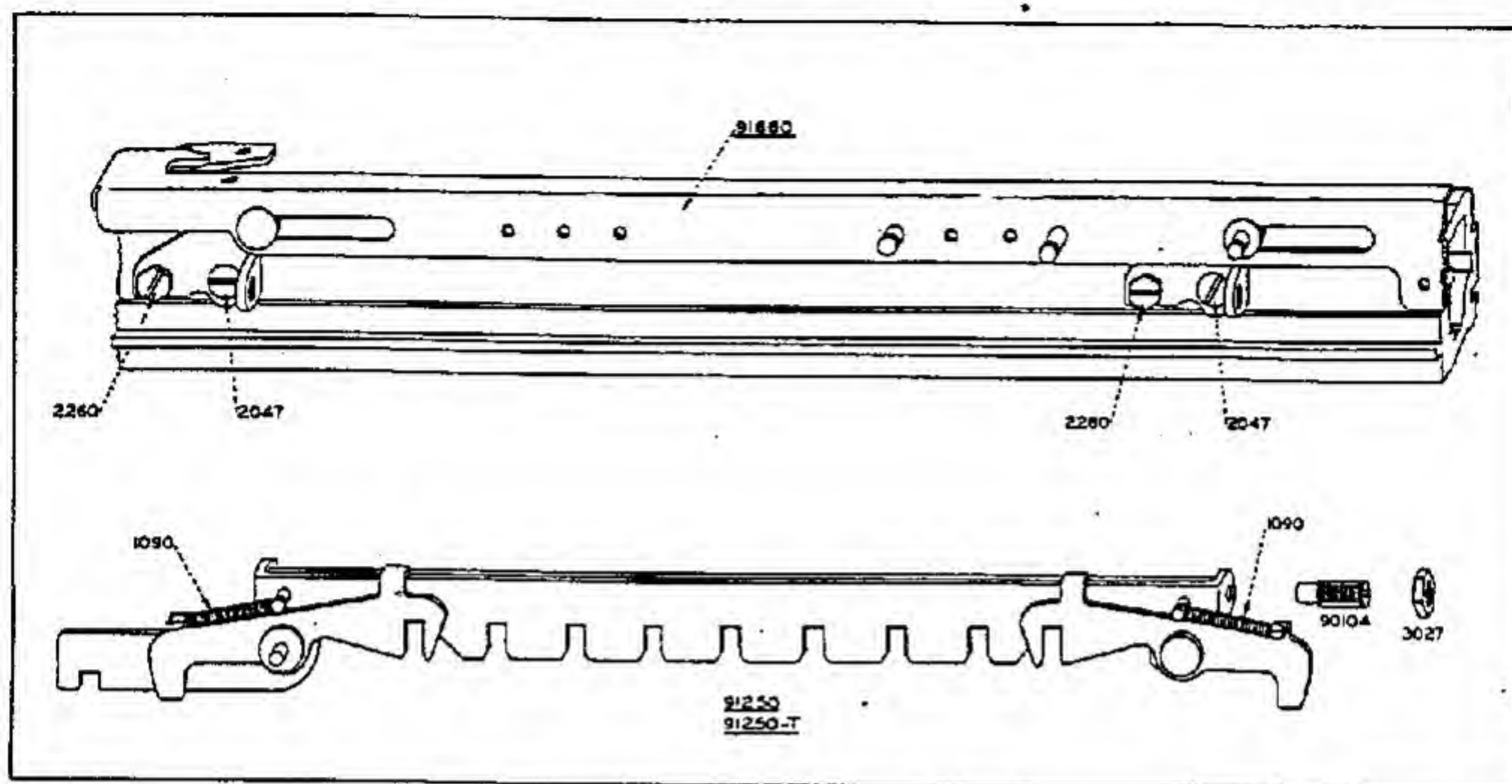
* These parts are not interchangeable from the new Keyboard to the old, however, the new Keyboard 81450 or 81450-T can be made interchangeable by filing .020 from Brace 31627 (see insert on reverse side of this page).

FRIDEN CALCULATING MACHINE CO., INC.
CARRIAGE

6-15-50

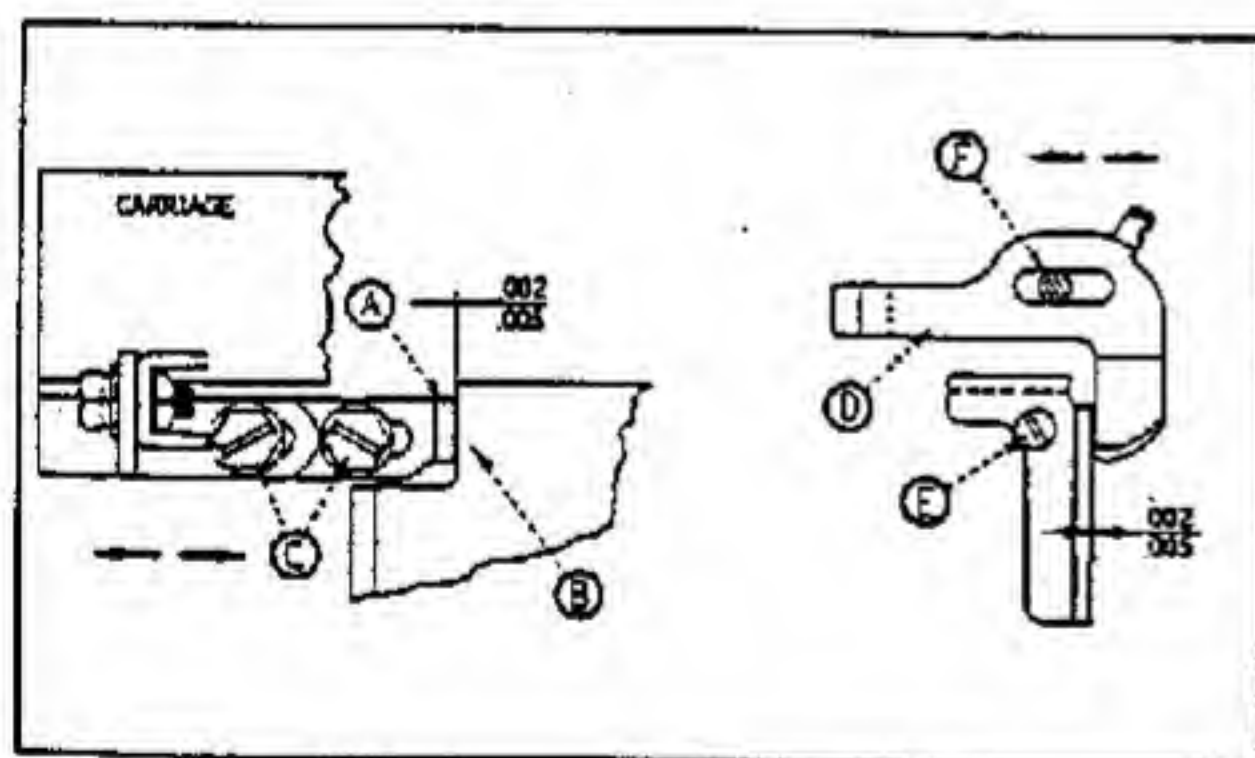






PARTS LIST AND ADJUSTMENTS

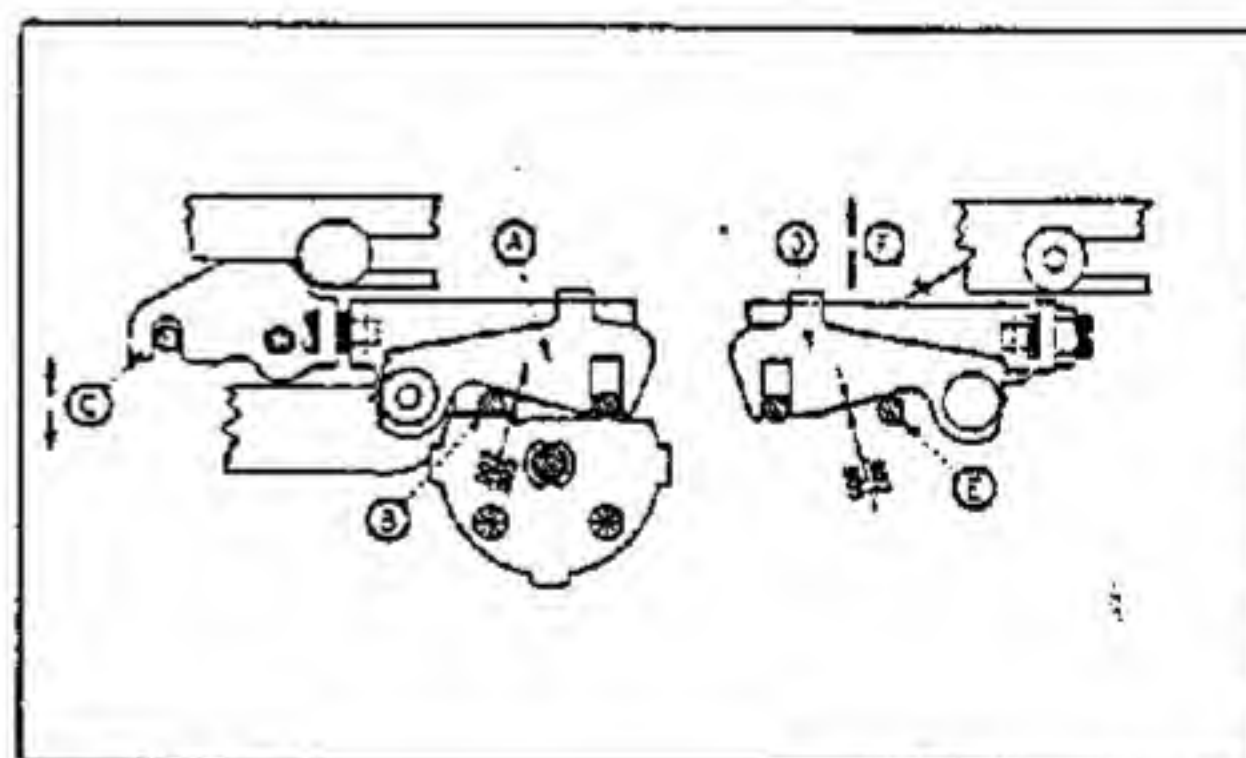
- 2260 6-32 X 1/4 Hex. Head Screw.
- 91250 Carriage Shift Rack Assembly - 8 Bank.
- 91250-T Carriage Shift Rack Assembly - 10 Bank.
- 91660 Optional Clear Slide Assembly.



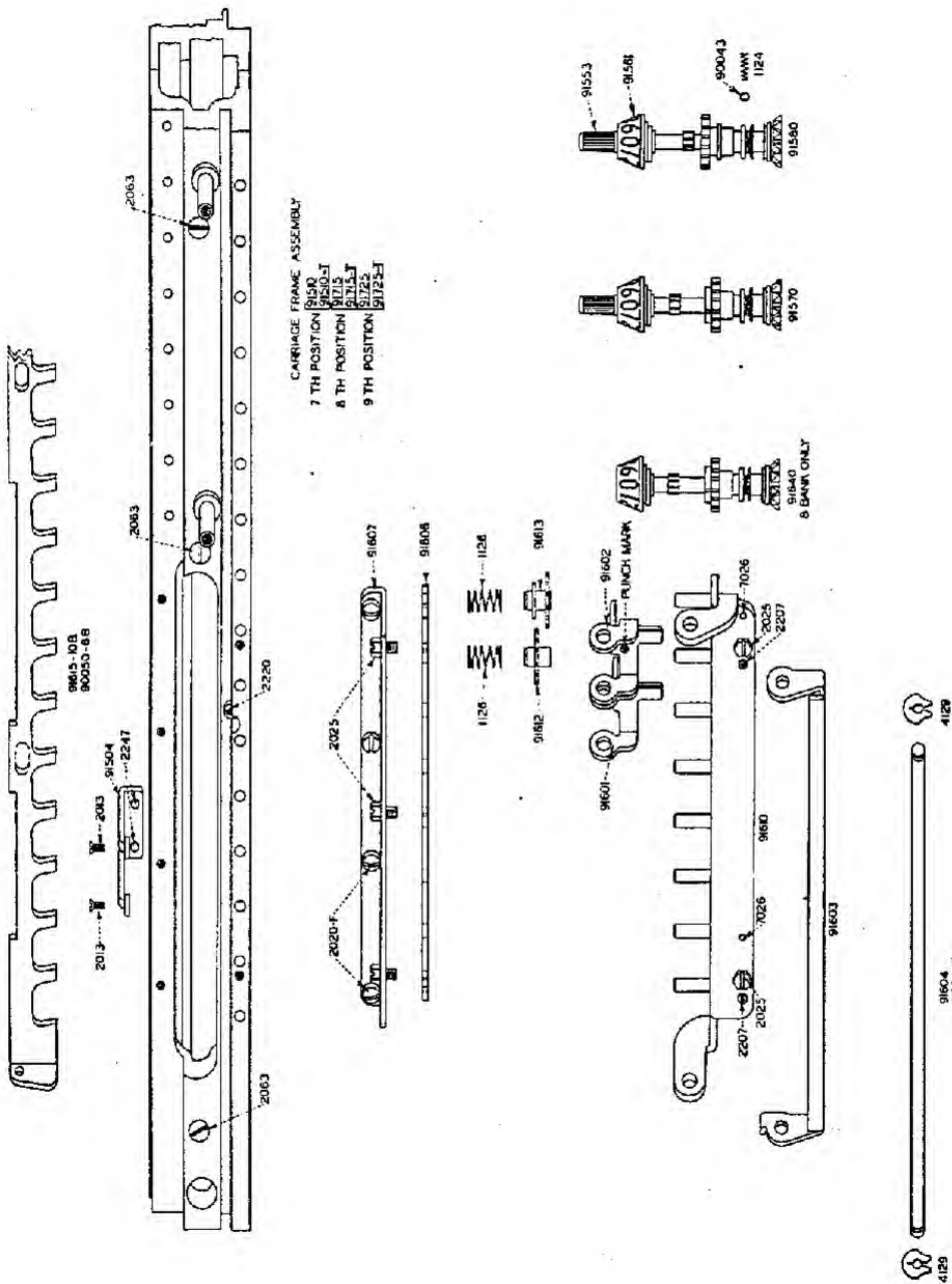
30 A - 31 A. CARRIAGE STOP-RIGHT: There should be .002 to .005 clearance between Stop A and Rear Bearing Plate B. Adjust at C.

LEFT: With Carriage in last position there should be .002 to .005 clearance between Stop D and Left Carriage Clamp E. Adjust at F.

NOTE: 10 Bank shown, but setting is the same for 8 Bank Models.



57 1/2. CARRIAGE SHIFT RACK: Move Carriage to the extreme left. There should be .002 to .005 clearance between Override Paul A and Shift Gear Pin B. Adjust at C. To lower Shift Rack, raise Bracket at C. To raise Shift Rack, lower Bracket at C. Move Carriage to extreme right. There should be .002 to .005 clearance between Override Paul D and Shift Gear Pin E. Adjust by raising or lowering Bracket F.

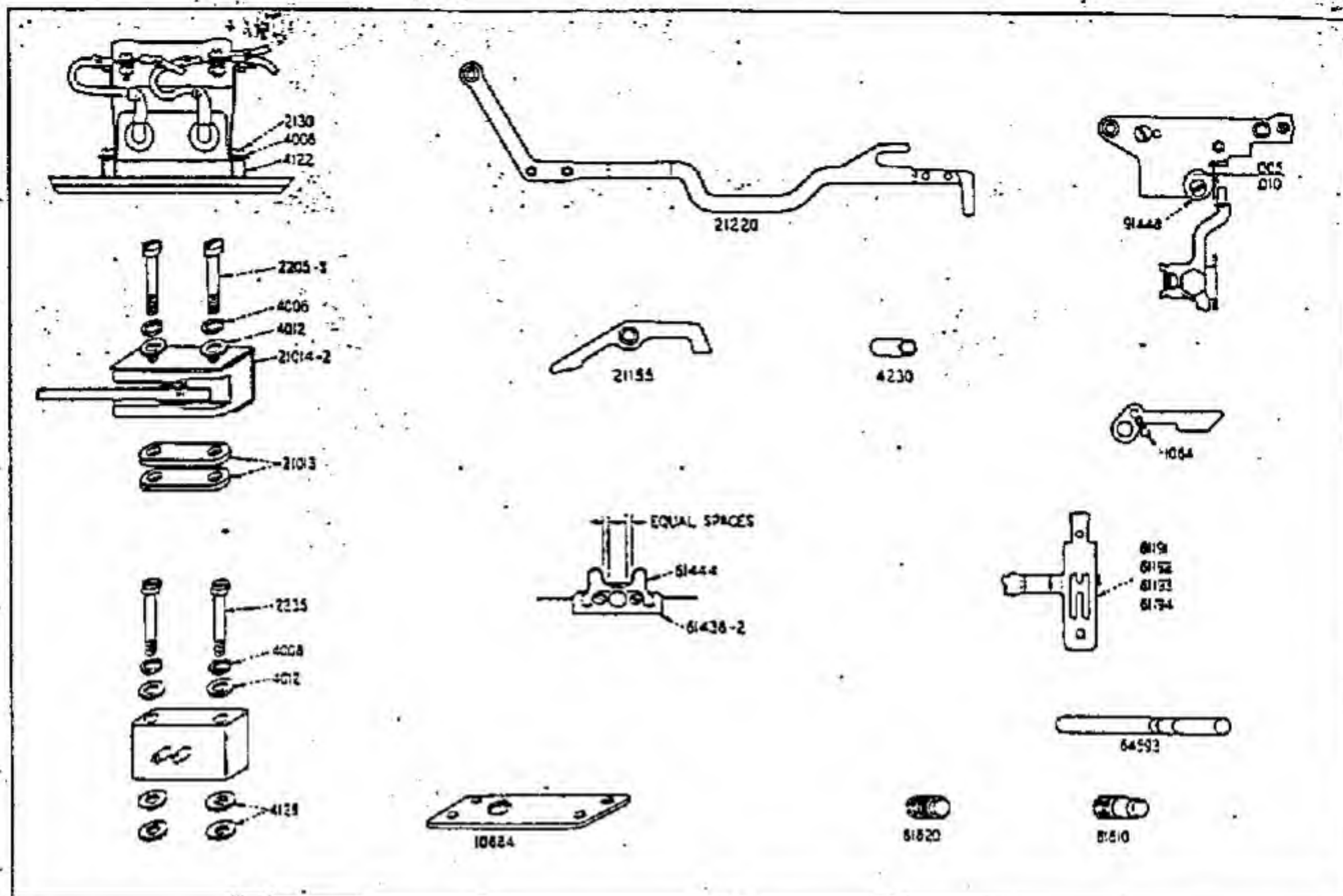


JAN 9 1951

12-15-50

FRIDEN CALCULATING MACHINE CO., INC.
PARTS CHANGES

Page 71-A
MODEL STW



PARTS LIST AND INSTRUCTIONS
KEEP YOUR SERVICE MANUALS UP TO DATE

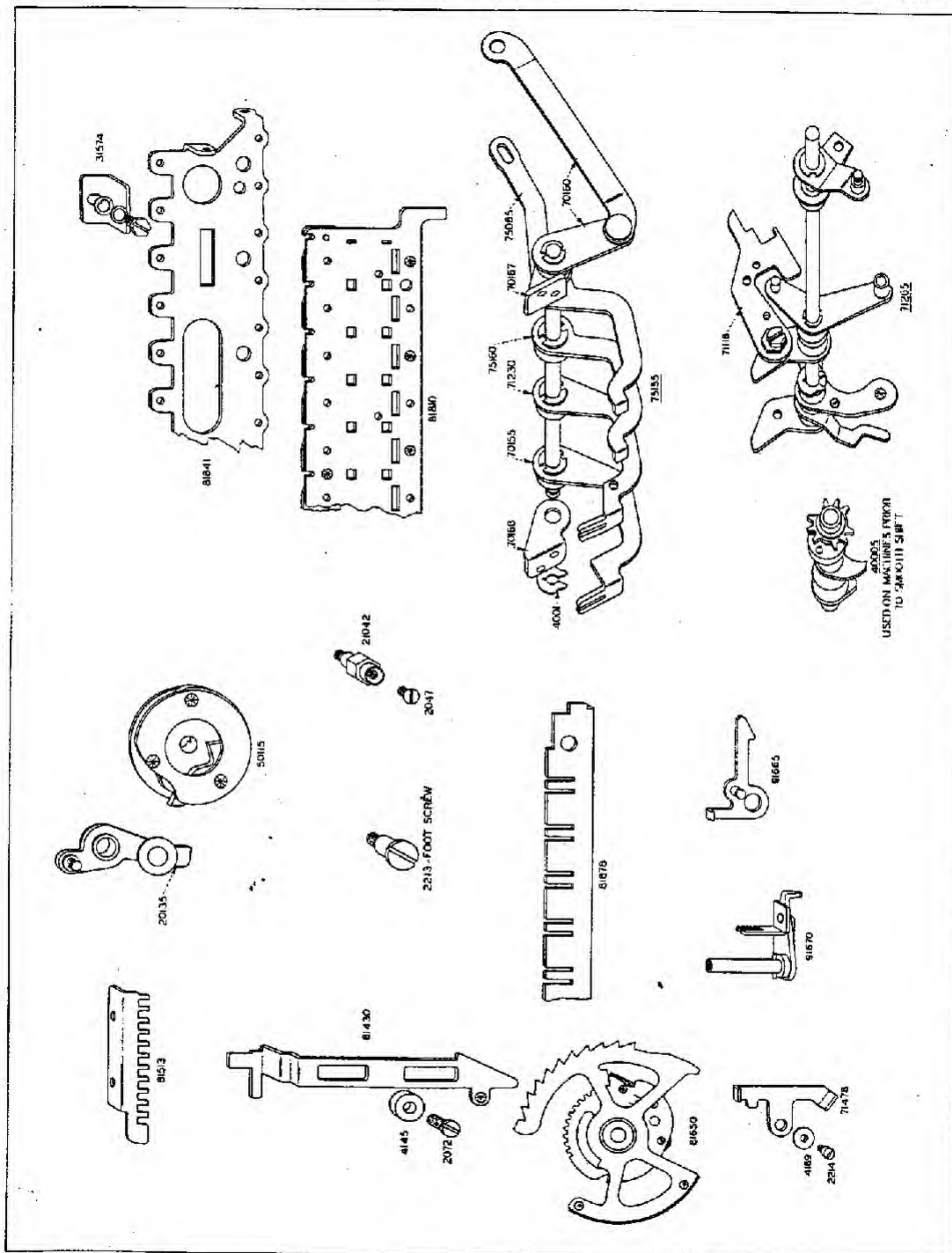
Locate and circle the parts numbers affected by this supplement wherever they appear in the Manual and make a note to see this page.

1064	Spring	Replaces	1101	-	INT.
2130	6-32 X 1/2 Fillister Head Screw	"	2050	-	N.INT.
2205-3	6-32 X 1 1/16 Fillister Head Screw	"	2051	-	N.INT.
2235	6-32 X 1 1/4 Hex. Head Screw	"	2205	-	N.INT.
4122	Spacer - New Usage				
4126	Spacer - New Usage				
*4230	Spacer	Replaces	4121	-	*INT.
10684	Motor Mounting Plate - New Part				
21013	Spacer for Micro Switch - New Usage				
21014-2	Insulator for Micro Switch	Replaces	21014	-	INT.
*21155	Keyboard Clear Link Release Lever Assem.	"	21040	-	*INT.
21220	Switch Control Lever Assem.	"	21020	-	INT.
61191	Multiplier Correction Key	"	61171	-	INT.
61192	Accumulative Mult. Key	"	61172	-	INT.
61193	Multiplier Key	"	61173	-	INT.
61194	Negative Mult. Key	"	61174	-	INT.
**61438-2	Shift Key Interlock Spring Clamp	"	61438	-	INT.
**61444	Plus and Minus Key Bumper Spring	"	61439	-	**INT.
64593	Tabulator Shift Actuating Levers Shaft	"	64584	-	INT.
81610	Bumper Assem., Mult. Select. Unit - 10 B.	Replaces	81606 - 81608	-	INT.
81620	Bumper Assem., Mult. Select. Unit - 8 B.	"	81607 - 81608	-	INT.
91448	Eccentric Stop for Bell Tapper Bail - New Part				

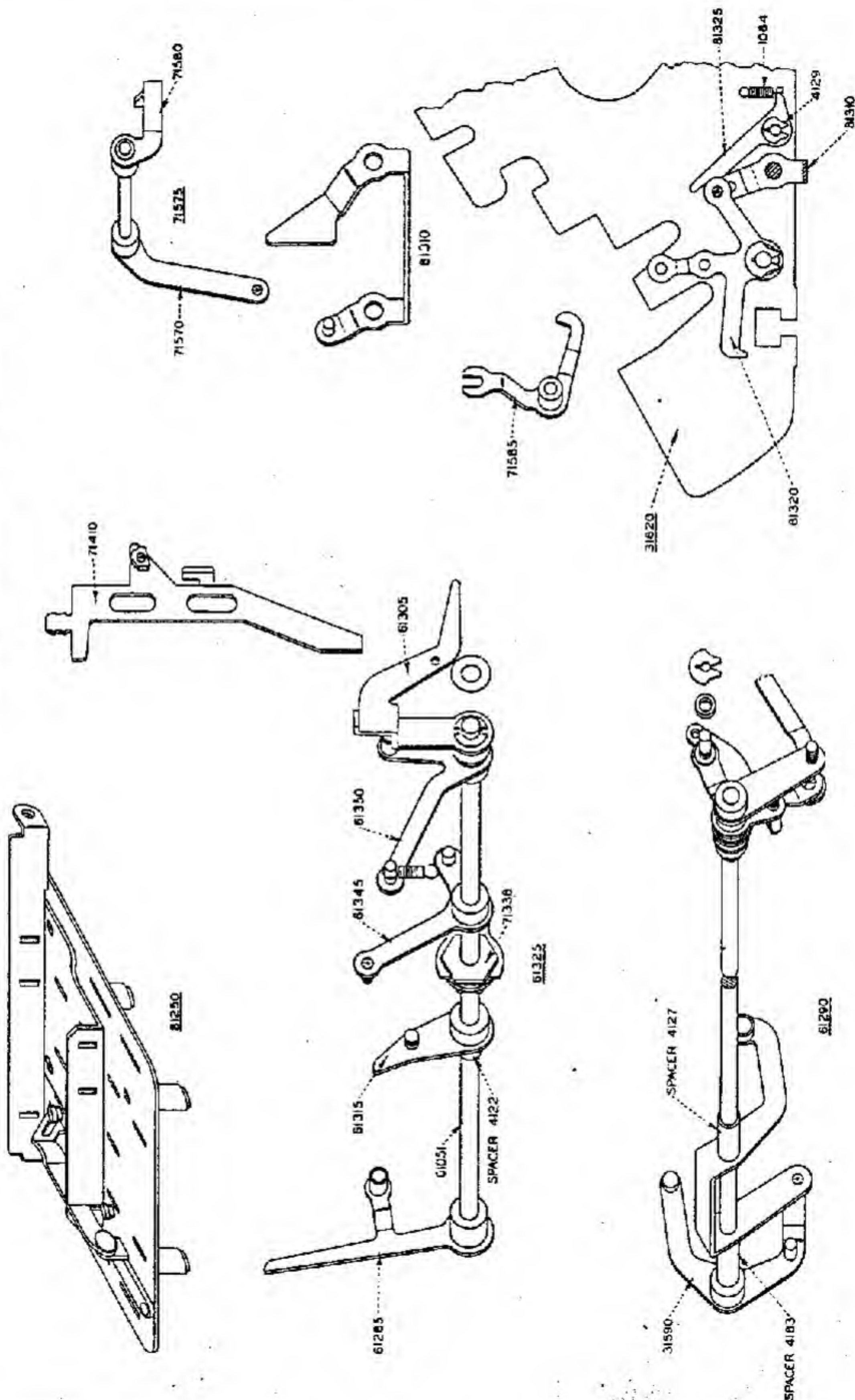
*Part No. 21155 is interchangeable with 21040 if Part No. 31605 is removed and Spacer 4121 is replaced by Spacer 4230. (See page 73.)

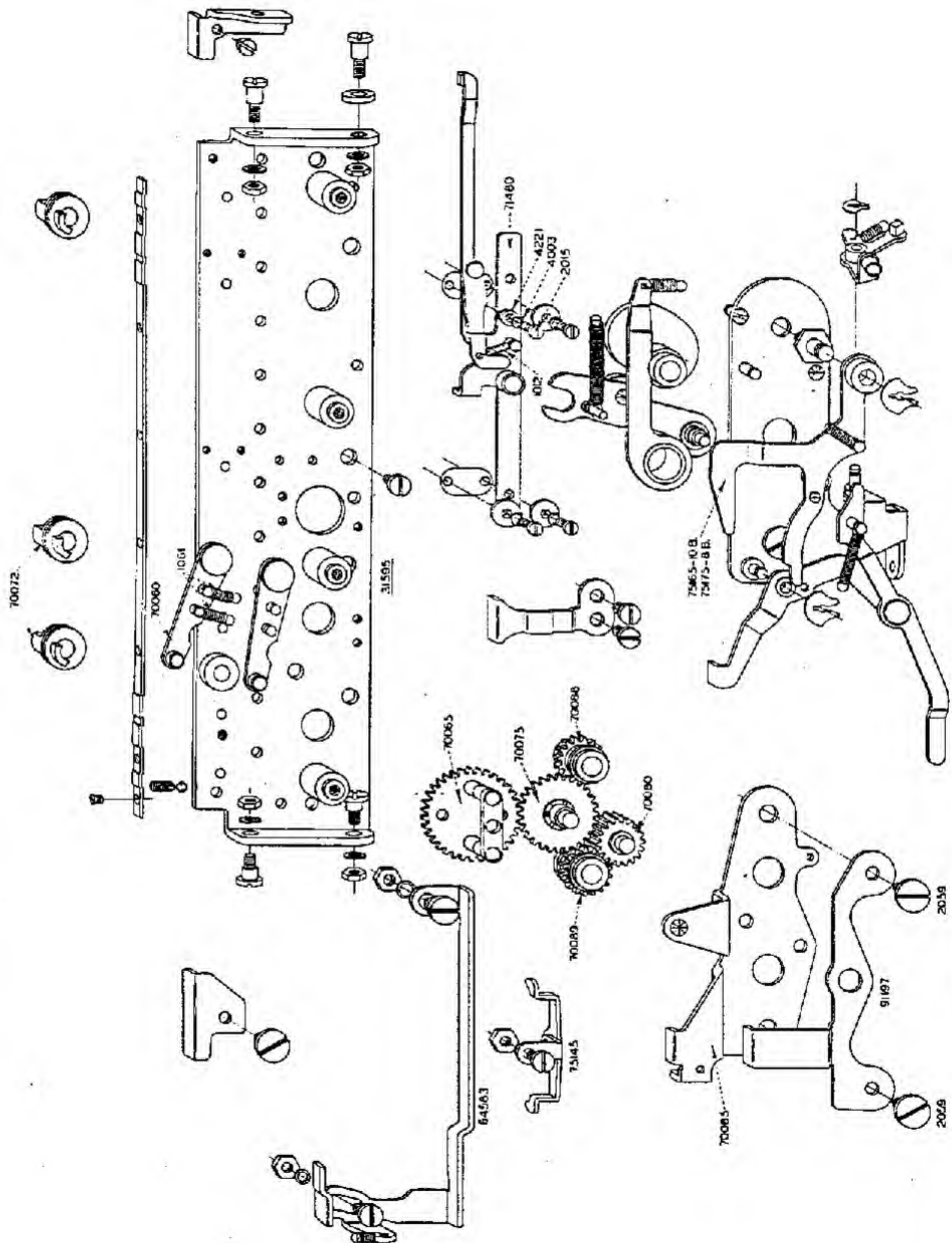
**Part No. 61444 is interchangeable with 61439 by using Shift Key Interlock Clamp 61438-2.

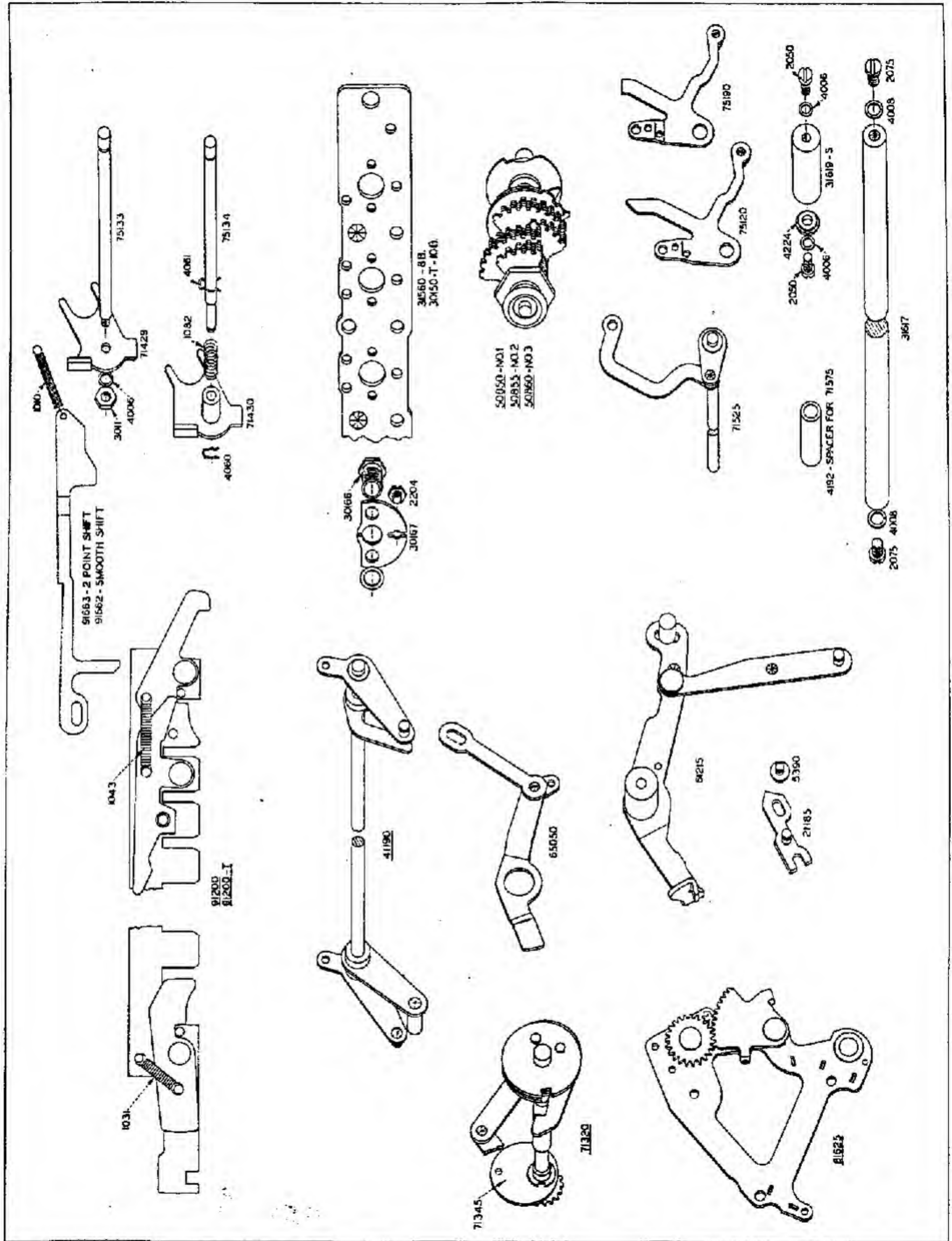
INSERT IN YOUR SERVICE MANUAL FACING PAGE 78



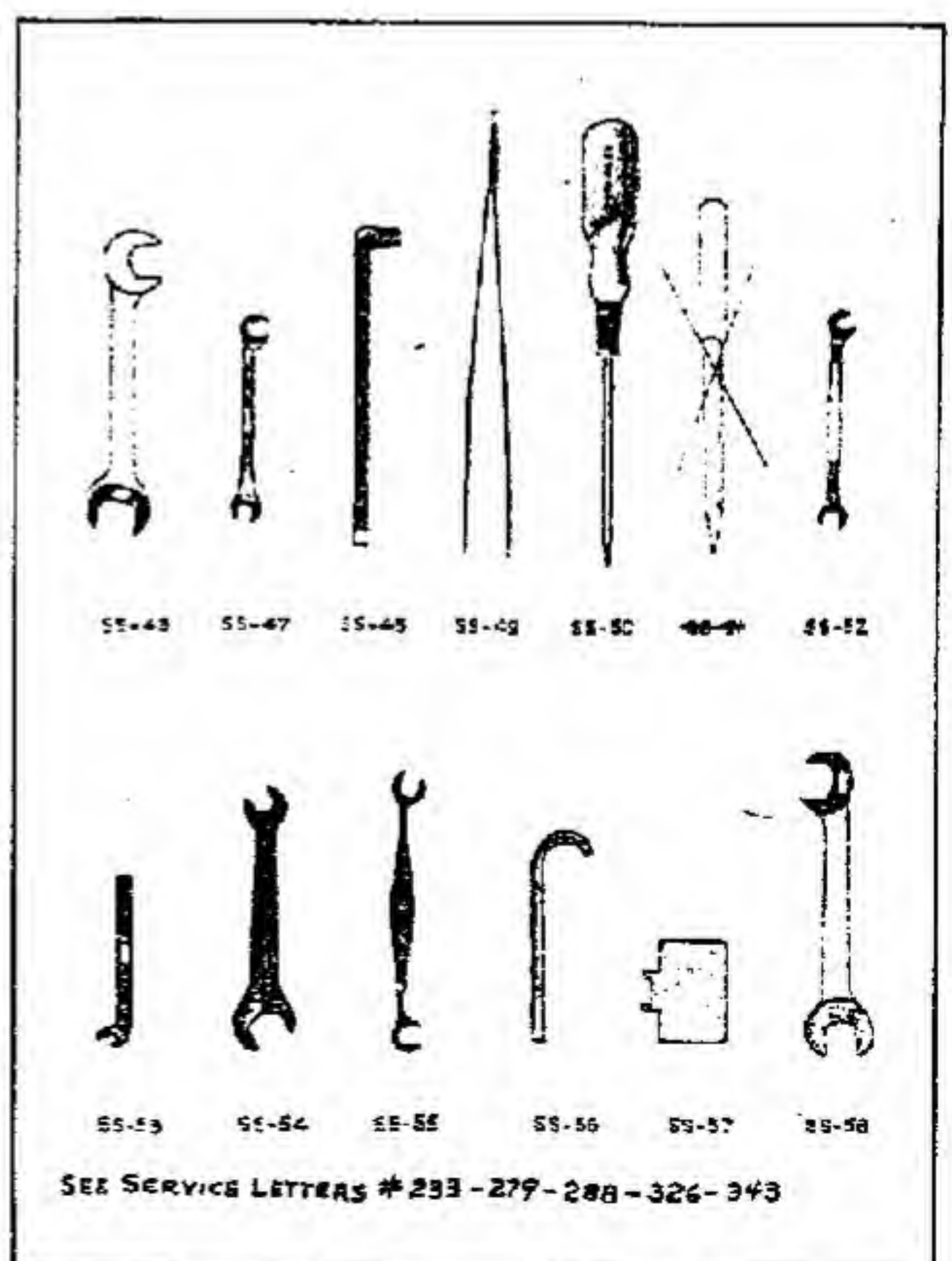
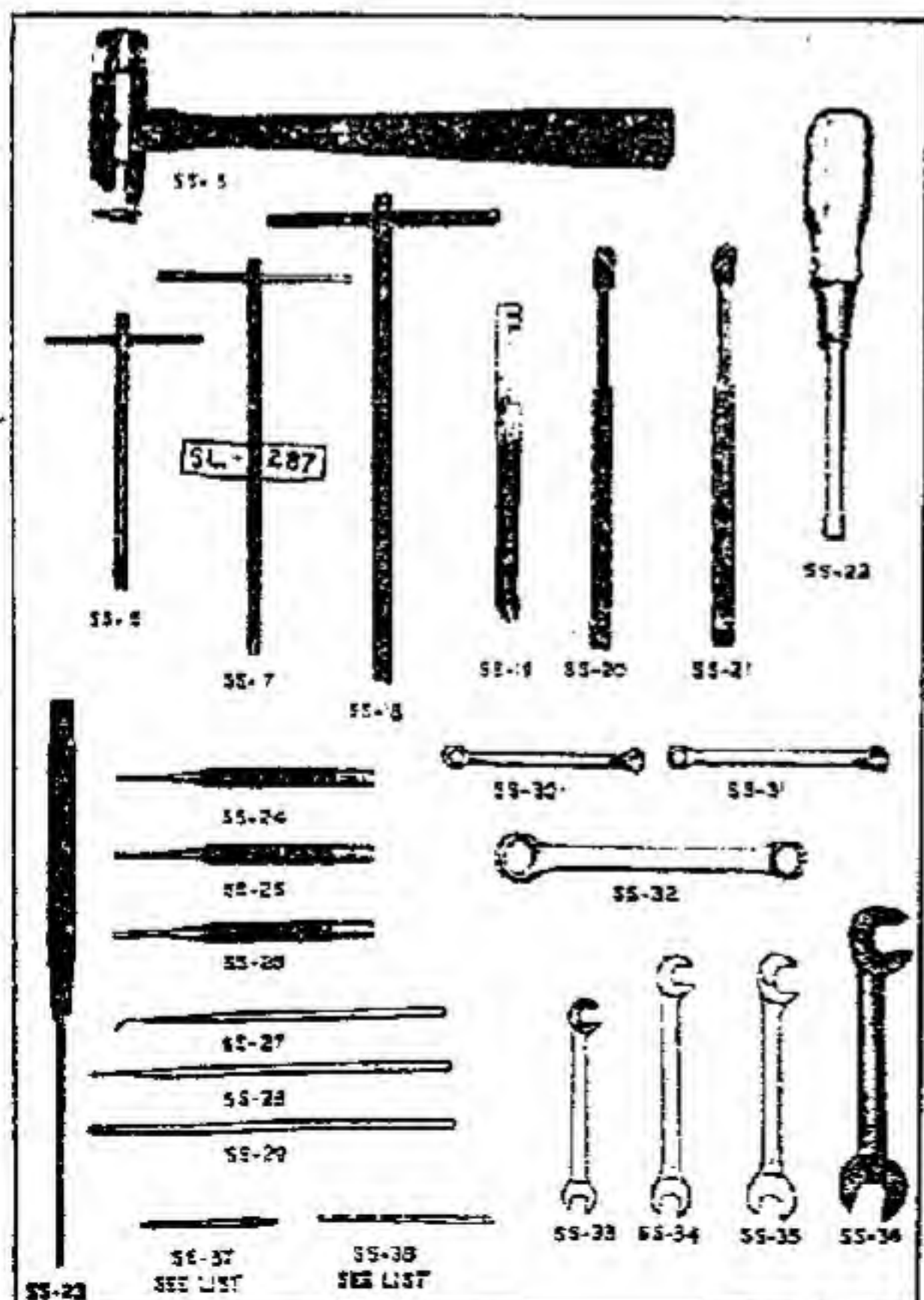
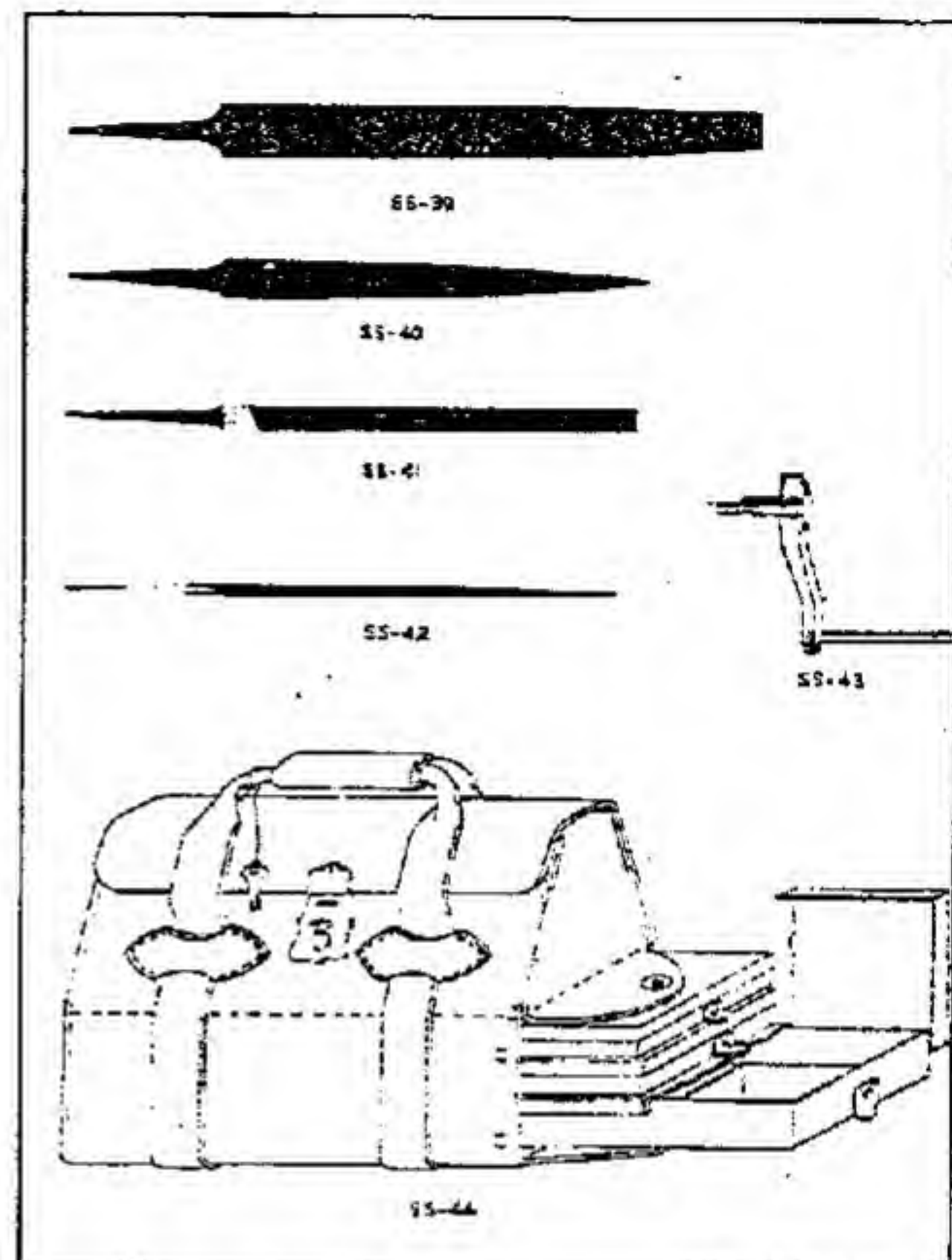
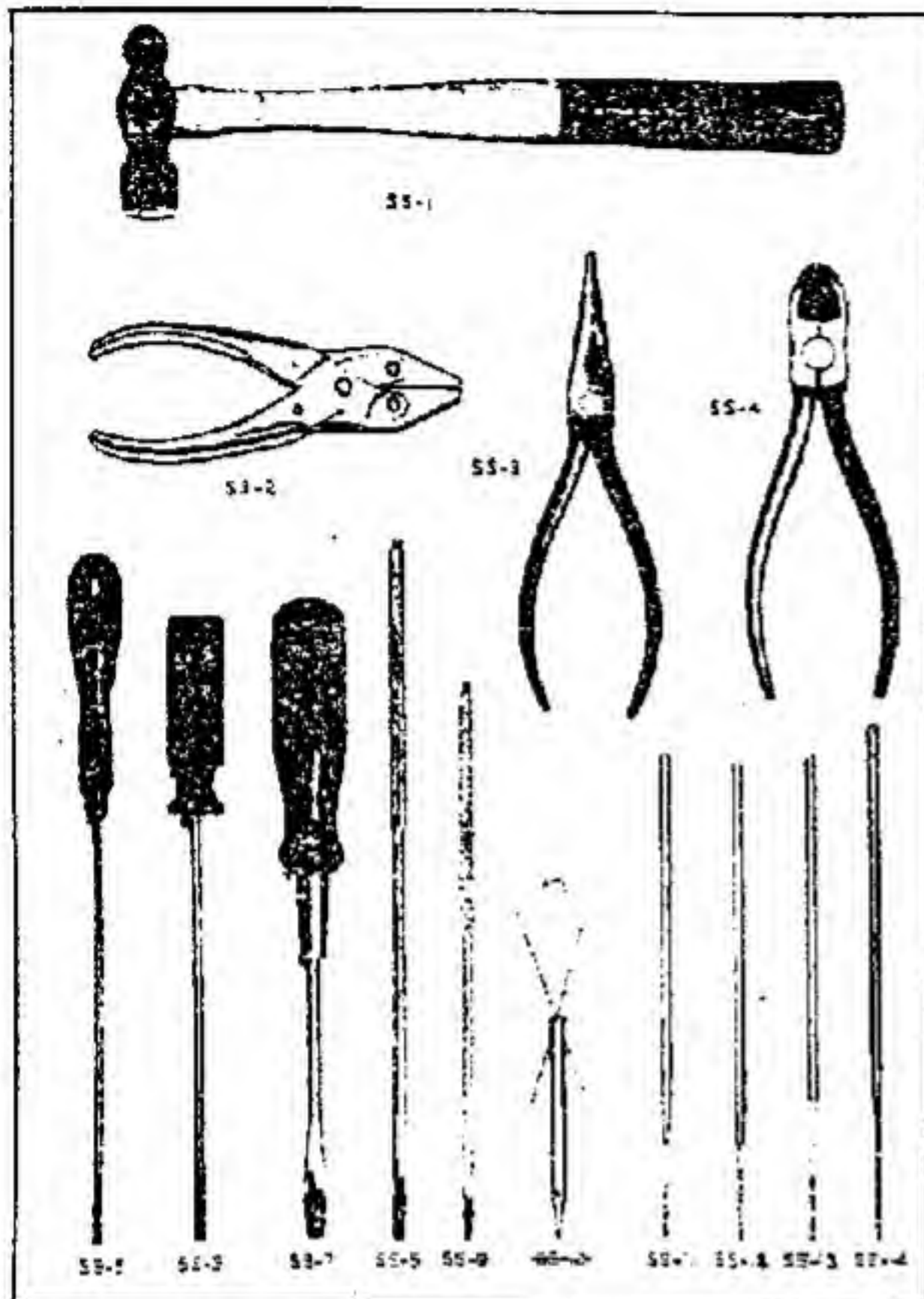
OBSOLETE USAGES







SERVICE TOOL AND PRICE LIST



SEE SERVICE LETTERS # 233-279-288-326-343

FRIDEN CALCULATING MACHINE CO., INC.

9-1-50

SERVICE TOOL AND PRICE LIST

		Price			Price
SS-1	4 oz. Ball Peen Hammer	\$ 1.32	SS-38-A	#48 Drill for 2-56 Tap.	\$.20
SS-2	5-1/2" Pliers (Bernard Parallel)	1.65	B	#44 Drill for 3-48 Tap. . . . .	.20
SS-3	6" Long Nose Pliers.	1.71	C	#41 Drill for 4-48 & 4-36 Taps	.21
SS-4	6" Diagonal Cutting Pliers. . .	2.01	D	#36 Drill for 5-40 Tap. . . . .	.23
SS-5	6" Screw Driver 1/8" Bit . . .	.38	E	#33 Drill for 6-32 & 6-40 Taps	.25
SS-6	6" Screw Driver 3/16" Bit . .	.52	F	#28 Drill for 8-32 Tap. . . . .	.30
SS-7	4" Screw Driver 1/4" Bit . . .	.41	G	#20 Drill for 10-32 Tap. . . . .	.34
SS-8	10" H.J.J. Screw Driver . . . .	.97	SS-39	8 Inch Mill File . . . . .	.55
SS-9	8" H.J.J. Screw Driver . . . . .	.97	SS-40	#1.6" Warding File. . . . .	.65
SS-10	Special Set Screw Wrench for 2181 Screw. . . . .	.75	SS-41	#1.6" Pillar File . . . . .	.46
SS-11	Number 52 Extension Drill. . .	.60	SS-42	#1.6" Round File . . . . .	.56
SS-12	Number 6/0 Extension Reamer	3.00	SS-43	Mechanic's Hand Crank.	1.00
SS-13	Number 48 Extension Drill. . .	.60	SS-44	Service Tool Case (Leather) Length 17-1/2", Width 6", Height 12"	35.00
SS-14	Number 5/0 Extension Reamer	3.00	SS-46	1/2" Open End Wrench . . . . .	.65
SS-15	Lucite Hammer	1.50	SS-47	3/16" Open End Wrench . . . . .	.56
SS-16	51287 T. Forming Tool - Short . . .	1.00	SS-48	Forming Tool for 41135 Bail .	1.50
SS-17	" T. Forming Tool - Medium . .	1.30	SS-49	Jewelers Tweezers. . . . .	.50
SS-18	" T. Forming Tool - Long	1.40	SS-50	Phillips Screw Driver - Size #1	.33
SS-19	Forming Tool Used on 64580 "	3.00	SS-51	Special Set Screw Wrench for 2194 Screw. . . . .	.75
SS-20	Forming Tool Right Used on 81520.	3.00	SS-52	7/32" Open End Wrench . . . . .	.58
SS-21	Forming Tool Left Used on 81520.	3.00	SS-53	Special 1/4" Wrench. . . . .	.50
SS-22	1/4" Spintite Socket Wrench. .	.72	SS-54	1/2" x 1/4" Open End Wrench	.35
SS-23	1/8"-Long Starrett Punch . . .	.50	SS-55	Special Double End Wrench for 30171. . . . .	.35
SS-24	1/16" Starrett Punch . . . . .	.33	SS-56	Forming Tool for 91602 Bail .	1.50
SS-25	3/32" Starrett Punch . . . . .	.39	SS-57	Trial Key for Full Capacity Carry Over. . . . .	.40
SS-26	1/8" Starrett Punch . . . . .	.39	SS-58	9/16" Open End Wrench . . . .	.34
SS-27	Flat Ball Pusher . . . . .	.75			
SS-28	Straight Ball Pusher .093. . . .	.75			
SS-29	Straight Ball Pusher .125. . . .	.75			
SS-30	3/16" x 3/64" Box Wrench . . .	.74			
SS-31	7/32" x 15/64" Box Wrench. . .	.70			
SS-32	3/8" x 7/16" Box Wrench . . . .	.83			
SS-33	1/4" Open End Wrench . . . . .	.56			
SS-34	5/16" Open End Wrench . . . . .	.56			
SS-35	3/8" Open End Wrench . . . . .	.56			
SS-36	7/16" Open End Wrench . . . . .	.65			
SS-37-A	2-56 Tap.	1.79			
B	3-48 Tap.	1.18			
C	4-48 Tap.	1.00			
D	4-36 Tap.	1.00			
E	5-40 Tap.	1.00			
F	6-32 Tap.	1.00			
G	6-40 Tap.	1.00			
H	8-32 Tap.	1.00			
I	10-32 Tap.	1.05			

SEE SERVICE LETTERS # 233
277
288
326
343

ABOVE PRICES SUBJECT TO CHANGE WITHOUT NOTICE

FRIDEN CALCULATING MACHINE CO., INC.

SERVICE TOOL AND PRICE LIST

		<u>Price</u>			<u>Price</u>
SS-1	4 oz. Ball Peen Hammer	\$1.25	SS-38-A	Number 48 Drill for	\$
SS-2	5-1/2 In. Pliers (Bernard Parallel.	1.90	B	2-56 Tap. . . . .	.30
SS-3	6 In. Long Nose Pliers	1.10	C	Number 44 Drill for	
SS-4	6 In. Diagonal Cutting Pliers .	1.75	D	3-48 Tap. . . . .	.30
SS-5	6 In. Screw Driver 1/8" Bit. .	.40	E	Number 41 Drill for	
SS-6	6 In. Screw Driver 3/16" Bit. .	.50	F	4-48 & 4-36 Tap. . . . .	.30
SS-7	4 In. Screw Driver 1/4" Bit. .	.50	G	Number 36 Drill for	
SS-8	10 In. H.J.J. Screw Driver . . .	1.25		5-40 Tap. . . . .	.35
SS-9	8 In. H.J.J. Screw Driver . . .	1.25		Number 33 Drill for	
SS-10	Special Set Screw Wrench for			6-32 & 6-40 Tap. . . . .	.35
	2181 Screw . . . . .	.75		Number 28 Drill for	
SS-11	Number 52 Extension Drill. . .	.60		8-32 Tap. . . . .	.40
SS-12	Number 6/0 Extension Reamer	3.00		Number 20 Drill for	
SS-13	Number 48 Extension Drill . .	.60		10-32 Tap. . . . .	.45
SS-14	Number 5/0 Extension Reamer	3.00	SS-39	8 In. Mill File . . . . .	.50
SS-15	Lucite Hammer	1.50	SS-40	Number 1, 6" Warding File	.55
SS-16	T. Forming Tool - Short	1.00	SS-41	Number 1, 6" Pillar File . . .	.50
SS-17	T. Forming Tool - Medium . .	1.30	SS-42	Number 1, 6" Round File . . .	.55
SS-18	T. Forming Tool - Long	1.40	SS-43	Mechanic's Hand Crank.	1.00
SS-19	Forming Tool Used on 64580 .	3.00	SS-44	Service Tool Case (Leather)	
SS-20	Forming Tool Right Used on			Length 17-1/2 In.,	
	81520.	3.00		Width 6 In., Height 12 In. . .	25.00
SS-21	Forming Tool Left Used on		SS-46	1/2" Open End Wrench. . . . .	.60
	81520.	3.00	SS-47	3/16" Open End Wrench . . . .	.60
SS-22	1/4 Inch Spintite Socket Wrench	.50	SS-48	Forming Tool for 41135 Bail .	1.50
SS-23	8 In. Long Starrett Punch. . . .	.50	SS-49	Jewelers Tweezers . . . . .	.50
SS-24	1/16 In. Starrett Punch . . . .	.35	SS-50	Phillips Screw Driver - Size #1	.45
SS-25	3/32 In. Starrett Punch . . . .	.35	SS-51	Special Set Screw Wrench for	
SS-26	1/8 In. Starrett Punch. . . . .	.40		2194 Screw. . . . .	.75
SS-27	Flat Ball Pusher . . . . .	.75	SS-52	7/32" Open End Wrench . . . .	.50
SS-28	Straight Ball Pusher .093. . . .	.75	SS-53	Special 1/4" Wrench . . . . .	.50
SS-29	Straight Ball Pusher .125. . . .	.75	SS-54	1/2" x 1/4" Open End Wrench	.35
SS-30	3/16 In. - 3/64 In. Box Wrench	.70	SS-55	Spc. (Double End) Wrench for	
SS-31	7/32 In.-15/64 In. Box Wrench	.70		30171. . . . .	.35
SS-32	3/8 In.-7/16 In. Box Wrench	.70	SS-56	Forming Tool for 91602 Bail .	1.50
SS-33	1/4 In. Open End Wrench. . . .	.50	SS-57	Trial Key for Full Capacity	
SS-34	5/16 In. Open End Wrench . . .	.50		Carry Over. . . . .	.40
SS-35	3/8 In. Open End Wrench. . . .	.50			
SS-36	7/16 In. Open End Wrench . . .	.55			
SS-37-A	2-56 Tap.	1.75			
B	3-48 Tap.	1.10			
C	4-48 Tap.95			
D	4-36 Tap.95			
E	5-40 Tap.95			
F	6-32 Tap.95			
G	6-40 Tap.95			
H	8-32 Tap.95			
I	10-32 Tap.	1.10			

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1006	Spring.	*72	1098	Spring.	*60
1007	Spring.	*62	1099	Spring.	68
1008	Spring.	72	1100-	Spring.	*57
1010	Spring.	*54	1101	Spring.	*67
1011	Spring.	*66	1102	Spring.	58
1012	Spring.	*66	1104-	Spring.	*71
1013	Spring.	*68	1105-	Spring.	*73
1014	Spring.	*55	1107-	Spring.	77
1015	Spring.	*55	1108	Spring.	75
1016	Spring.	77	1109-	Spring.	75
1017	Spring.	*56	1114	Spring.	64
1018	Spring.	68	1115-	Spring.	*56
1019	Spring.	*56	1117	Spring.	*73
1022	Spring.	57	1118	Spring.	74
1023	Spring.	*55	1119-	Spring.	53
1024	Spring.	67	1121-	Spring.	67
1025	Spring.	*56	1122-	Spring.	*66
1028	Spring.	*62	1124-	Spring.	78
1031	Spring.	*55	1125	Spring.	74
1033	Spring.	68	1126-	Spring.	78
1034	Spring.	*55	1127-	Spring.	60
1037	Spring.	77	1128-	Spring.	54
1039	Spring.	*55	1129-	Spring.	*57
1040	Spring.	*57	1130	Spring.	*75
1041	Spring.	*55	1131	Spring.	*54
1043	Spring.	*76	1132-	Spring.	77
1045	Spring.	*55	1133	Spring.	*55
1048	Spring.	*57	1142-	Spring.	72
1049	Spring.	64	2009-	2-56 x 3/16 Fillister Head Screw	74
1052	Spring.	57	2010	2-56 x 1/4 Fillister Head Screw	75
1054	Spring.	*55	2013	2-56 Special Flat Head Screw	*53
1056	Spring.	73	2015	3-48 x .240 Special Fillister	
1058	Spring.	*71		Head Screw.	*67
1059	Spring.	*57	2016-	3-48 x 3/16 Fillister Head Screw	65
1061	Spring.	*69	2017	3-48 x 1/8 Flat Head Screw	68
1062	Spring.	*56	2020	4-48 x 3/16 Fillister Head Screw	*67
1063	Spring.	62	2020-F	4-48 x 3/16 Special Screw	78
1064	Spring.	*59	2021	4-48 x 3/8 Fillister Head Screw	*65
1066	Spring.	75	2022	4-48 x 1/4 Fillister Head Screw	*67
1069	Spring.	73	2024-	4-48 x 7/32 Special Hex.	
1070	Spring.	68		Head Screw.	55
1071	Spring.	54	2025-	4-48 x .200 Special Hex.	
1072	Spring.	*56		Head Screw.	*55
1073	Spring.	*59	2026-	4-48 x 5/16 Flat Head Screw	66
1074	Spring.	*75	2030	4-48 x 1/4 Special Screw	*65
1075	Spring.	*68	2032	4-48 x .218 Special Screw	59
1076	Spring.	*61	2034-	4-48 Special Screw	*59
1077	Spring.	*63	2037	5-40 x .156 Special Screw	*75
1078	Spring.	*67	2039	4-48 Special Screw	72
1081	Spring.	73	2041-	4-36 x 1/2 Fillister Head Screw	*59
1082	Spring.	*73	2043	6-40 Special Screw	*71
1086	Spring.	68	2044-	6-40 Special Screw	*57
1087	Spring.	75	2045	6-40 Special Screw	*57
1088	Spring.	54	2047	6-32 x 1/4 Flat Head Screw	*75
1090	Spring.	*62	2049-	6-32 x 1/4 Fillister Head Screw	62
1092	Spring.	*65	2050	6-32 x 3/8 Fillister Head Screw	*54
1094	Spring.	65	2051-	6-32 x 1 Fillister Head Screw	54

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2059	6-32 x 9/32 Special Screw	*65	2196 -	Special Screw	*57
2060	6-40 Special Screw	57	2200 -	Special Screw (Left Hand Thread)	*71
2061	6-40 Special Screw	*57	2201 -	6-40 x 3/4 Fillister Head Screw	*71
2063 -	6-32 x 1 1/8 Flat Head Screw	*76	2202 -	6-40 x 5/8 Fillister Head Screw	68
2064	6-32 x 3/16 Fillister Head Screw	*71	2204 -	Special Screw	81
2067 -	6-40 Special Screw	76	2205 -	6-32 x 1 3/16 Fillister Head Screw	54
2070	6-40 x 1/4 Fillister Head Screw	*65	2207 -	4-48 x 1/8 Set Screw	78
2071	6-40 x 3/8 Fillister Head Screw	*65	2208 -	Special Screw	76
2072	6-40 x 5/8 Fillister Head Screw	*71	2209 -	3-48 x 1/8 Round Head Screw	*74
2075	8-32 x 3/8 Fillister Head Screw	*59	2210 -	Special Screw	77
2085 -	10-32 x 1/8 Headless Set Screw	68	2211 -	Special Screw	74
2086	6-40 Dowel Screw	*72	2212 -	Special Screw	67
2088 -	6-40 Special Screw Stud	*68	2213 -	Special Screw	79
2089	6-40 Special Screw Stud	75	2214 -	3-48 x .350 Fillister Head Screw	79
2090 -	6-40 x 3/16 Fillister Head Screw	*65	2215 -	Special Screw	*74
2092	Special Screw	64	2216 -	Special Screw	*71
2096	6-40 x .185 Special Screw	*57	2217 -	3-48 x .150 Fillister Head Screw	77
2098	Special Screw Stud	*71	2218	Special Screw	*54
2099	Special Screw Stud	*71	2219	Special Screw	53
2100 -	Special Screw	*71	2220 -	Special Screw	78
2101	Special Screw	*57	2222	Special Screw	*72
2102 -	Special Screw	*71	2224 -	Special Screw	*67
2105 -	6-40 x 5/16 Flat Head Screw	*68	2225 -	Special Screw	75
2106	Special Screw	*65	2226	Special Screw	64
2108	Special Screw	*68	2227 -	Special Screw	75
2109 -	6-40 Headless Screw	59	2228 -	Special Screw	60
2113 -	4-48 x 5/16 Fillister Head Screw	68	2229	Special Screw	72
2114	4-48 x .130 Fillister Head Screw	*68	2230	Special Screw Stud	76
2115 -	4-48 x 5/32 Special Screw	*65	2234 -	6-32 x 3/16 Fillister Head Screw	77
2120	3-48 x .182 Special Screw	*77	2236 -	Special Screw	73
2126	Special Screw	65	2238	Special Screw	*57
2127 -	Special Screw	65	2239 -	Special Screw	*54
2130 -	6-32 x 1/2 Fillister Head Screw	*70	2242 -	4-36 x 1/4 Oval Head Phillips Screw	*53
2132 -	6-32 x 3/8 Round Head Screw	54	2246	4-48 x 1/8 Round Head Screw	74
2133 -	6-32 x 2 1/2 Fillister Head Screw	54	2247 -	4-48 x 3/32 Set Screw	78
2137	Special Screw	64	2248	Special Screw	*54
2141	Special Screw	77	3004	3-48 x 3/16 Hex.Nut	*67
2142 -	6-40 x 5/16 Fillister Head Screw	62	3005 -	4-36 x 1/4 Square Nut	*59
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2152 -	Special Screw	*57	3011	5-40 x 1/4 Hex.Nut	*68
2155 -	6-40 x .343 Special Screw	*65	3012 -	5-40 Special Hex.Nut	75
2158 -	Special Screw	68	3014 -	6-32 x 1/4 Hex.Nut	*54
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2162 -	Special Screw	57	3018	6-40 x 1/4 Hex.Nut	*61
2167 -	Special Screw	72	3026 -	10-32 Special Hex.Nut	66
2169 -	Special Screw	*71	3027	12-32 Special Hex.Nut	*77
2170 -	Special Screw	*71	3028 -	12-32 Special Nut	75
2173 -	Special Screw	55	3031 -	5/16 x 32 Special Hex. Nut	*74
2176 -	Special Screw	76	3032 -	Special Nut	64
2177 -	Special Screw	75	3035 -	4-48 Special Nut	66
2178 -	Special Screw	58	3036 -	6-40 Special Nut	76
2179 -	4-48 x 3/16 Set Screw	59	4000 -	Snap Washer for .093 Diameter Stud	*57
2180 -	Special Screw	*71	4001 -	Snap Washer for .125 Diameter Stud	*67
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4007	#5 Special Lock Washer	57	4166	Roller.	*71
4008	#8 Lock Washer	*60	4167	Roller.	71
4009	#6 Lock Washer	57	4169	Roller.	*71
4012	Washer	*68	4171	Spacer	75
4013	Washer	*57	4172	Spacer	75
4016	Washer	*57	4173	Spacer	75
4017	Washer	*72	4174	Spacer	75
4019	Snap Washer for .143 Diameter Stud	*57	4175	Spacer	75
4023	Spacer	57	4176	Spacer	75
4026	Spacer	*68	4180	Spacer	68
4032	Spacer	75	4183	Spacer	73
4033	Washer	*65	4184	Spacer	74
4035	Spacer	*71	4185	Spacer	67
4038	Spacer	71	4187	Spacer	71
4039	Spacer	*71	4188	Spacer	74
4052	Collar for Div. Throwout Actuator	67	4189	Bearing	79
4058	Collar for Add-Subtract Gate	68	4190	Collar.	*60
4060	Spring Clip	*72	4191	Roller.	77
4061	Spring Clip	*73	4192	Spacer	81
4062	Spring Clip	*57	4193	Spacer	73
4069	Washer	*65	4194	Spacer	66
4072	Washer	*71	4196	Spacer	*67
4073	Washer	*71	4197	Spacer	68
4074	Washer	*71	4198	Shim	*69
4075	Spacer	*71	4199	Washer	*74
4077	Washer	64	4203	Thrust Washer	68
4078	Spacer	*71	4204	Washer	*72
4080	Spacer	62	4205	Washer	*68
4084	Spacer	*62	4209	Washer	72
4087	Spacer	58	4210	Roller.	75
4089	Spacer	68	4211	Roller.	*71
4097	Roller.	62	4215	Spacer	76
4099	Roller.	72	4218	Spacer	*71
4101	Roller.	75	4220	Bearing	71
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4107	Roller.	*71	4222	Bearing	72
4112	Spacer	72	4224	Washer	81
4113	Spacer	65	4229	Roller.	*73
4116	Spacer	*62	4231	Shim	76
4117	Spacer	62	4232	Shim	76
4121	Spacer	73	5013	Stud.	57
4122	Spacer	73	5171	Stud.	62
4126	Washer	71	5213	Stud.	*76
4127	Spacer	73	5218	Stud.	62
4128	Spacer	*74	5266	Stud.	59
4129	Snap Washer	*57	5268	Stud.	*66
4131	Snap Washer	*66	5317	Stud.	62
4132	Collar.	73	5390	Stud.	81
4137	Spacer	71	5391	Stud.	57
4140	Spacer	57	5438	Stud.	54
4141	Spacer	*77	6022	Bearing	*71
4143	Spacer	*65	6023	Bearing	*71
4145	Spacer	*71	6028	Bearing	*70
4146	Spacer	55	6073	Bearing	62
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6096	Eccentric Stop	62	11335	Decimal Marker Restore	
6144	Bushing	57		Slide Assembly	
6159	Bearing	68	11337	Retaining Plate - Decimal	
6164	Bearing	57		Marker Restore Slide	
7014	.0625 x .380 Straight Pin	*76	11338	Carriage Position Indicator	
7025	Cotter Pin	74	11342	Front Top Cover Bracket -	
7026	Dowel Pin	78		Front	54
7030	5/0 x 5/8 Taper Pin	*67	11343	Front Top Cover Bracket -	
7031	5/0 x 1/2 Taper Pin	67		Rear	66
7033	6/0 x 1/2 Taper Pin		11344	Front Top Cover Bracket -	
7034	5/0 x 7/16 Taper Pin	*68		Rear	66
7041	Special Head Rivet	76	11347	Multiplier Check Dial	
10006	Resistor for Governor - 230 Volt	54		Decimal Bar	53
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10040	Extension Cord	53		Check Dials	53
10035	Terminal Block Assembly	54	<u>11350</u>	Back Cover Assembly	53
10038	Motor Governor - A.C. - D.C. .	54	11353	Back Cover Bracket - Lower . .	54
10050	Lead Wire Assembly	54	11354	Back Cover Bracket - Upper . .	53
10059	Motor Governor - Split Ring for		11357	Multiplier Decimal Pointer . . .	53
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10060	Capacitor - 115-230 Volt	54		1/32 Thick	66
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	& Motor Wires	54	20007	Drive Shaft Bearing - Right . .	*68
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10371	Motor Brush	54		Right	*66
10379	Governor Brush	54	20047	Eccentric for Division	
10450	Friden Motor Assembly -			Stop Detent	*57
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11017	Dust Cover	53	20097	Shaft for Counter Oscillator	
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11335	Decimal Marker Restore			Lever Assembly	*57
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21158	Restore Lever for Division Stop	55	30166	Bearing for Adjusting Actuators	81
21160	Auxiliary Division Latch		30167	Plate for Adjustable Actuator	
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21165	Division Latch Assembly	*57	30171	Bearing for Adjusting Actuators	68
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24520	Return Clear Key Delatching		31045	Power Set Cam Throwout	
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	Assem.	*58	34020-T	Center Bearing Plate	
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31632	Correction Key Clutch		40006	Division Control Gear	
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40066	Bellcrank for Division Shift Shaft	56	40025	Bellcrank Lifter Assem.	
40067	Bracket for Division Shift		40030	Bellcrank Lifter Pawl Assem.	
	Shaft Bellcrank.	56	41155	Counter Blockout Disabling Assem.	
40070	Division Control Gear &		41186	Bellcrank Lifter Shaft - Division	
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40006	Division Control Gear		41190	Bellcrank Lifter Shaft Assem. . .	81
40007	Division Control Gear Shaft		41514	Centralizer for Counter	66
40008	Division Control Eccentric		41515	Centralizer Pawl Assem.	66
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7034	5/0 x 7/16 Taper Pin		41514	Centralizer for Counter	
40501	Counter Oscillating Collar . . .	66	41555	Counter Carrier Sub Assembly	
41060	Blocking Arm Assem. -		41560	Counter Rocker Lever Assem.	
	Complete Transfer Division	60	44530	#2 to #9 Counter Transfer	
41106	Division Shafts Support Bracket	*67		Lever Assem.	
41107	Control Slide for Division		44620	#1 Counter Tooth & Lock Assem.	
	Throwout Actuator	*67	1011	Spring	
41110	Shift Actuating Collar &		1012	Spring	
	Shaft Assem.	*67	2181	4-48 x 1/8 Set Screw	
40045	Shift Throwout Actuator Assem.		2194	6-40 x 1/8 Set Screw	
41115	Shift Actuating Collar &		3026	10-32 Special Hex. Nut	
	Lever Assem.		4194	Spacer for Counter - 8 Bank	
7034	5/0 x 7/16 Taper Pin		41550-T	Counter Carrier Assembly -	
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41114	Shift Control Latch - Division .	67	41514	Centralizer for Counter	
41115	Shift Actuating Collar &		41555	Counter Carrier Sub Assembly	
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41120	Shift Engaging Levers Assem. .	67	44530	#2 to #11 Counter Transfer	
41125	Shift Reverse Assem. -			Lever Assem.	
	Last Position.	72	44620	#1 Counter Tooth & Lock Assem.	
41128	Shift Reversing Bail - Division	67	1011	Spring	
41130	Connector Arm - Division		1012	Spring	
	Throwout Assem. - 8 Bank .	67	2181	4-48 x 1/8 Set Screw	
41130-T	Connector Arm - Division		2194	6-40 x 1/8 Set Screw	
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41145	Sensing Fingers Actuating		44033	Bell Tapper	
	Lever Assem.	58	44034	Bell Tapper Wire	
41148	Sensing Fingers Detecting Lever	58	1014	Spring	
41150	Counter Blockout Rocker		2032	4-48 x .218 Special Screw	
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44011	Bell Tapper Lever	59	50659	Retainer for Counter	
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44034	Bell Tapper Wire	59		Shaft Assem.	68
44035	Bell Tapper Disabling		50695	Add-Subtract Gear Shaft Assem.	
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44040	Bell Tapper Lever Assem. -		50850	#1 Actuator Shaft Assem.	81
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44047	Bell Tapper Lever Bracket		50875	#3 Actuator Shaft Assem.	68
1064	Spring		50880	#1 Actuator Shaft Assem.	68
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2109	6-40 Special Screw		51045	Power Set Cam Assem.	68
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4006	#6 Lock Washer		51056	Drive Collar for Power Set Cam	
5266	Stud for Bell Tapper Levers		51070	Multiplier Eccentric Feed	
44046	Bell Tapper Lever	59		Pawl Assem.	
44047	Bell Tapper Lever Bracket . . .	59	51080	Counter Rocker Cam Assem.	
44050	Blocking Arm Assem. -		54565	Division Drive Gear Assem.	
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50091	Slip Clutch Driver	68	51645	Add-Subtract Gate Bumper	
50092	Motor Coupling	68		Arm Assem.	
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7030	5/0 x 5/8 Taper Pin		71275	Interlock Shaft Operating	
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71290	Clear Clutch Engaging Link			Lever Assem.	73
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71320	Shift Setting & Dial Reset			Assem.	80
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71345	Setting Dial Restore Cam Assem.	81		Assem.	
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31225	Shift Opening Lever Assem.		71500	Multiplier Shift Shaft Assem.	*58
71375	Clear Disengaging Lever Assem.		71022	Key for Mult. Unit Shift Collar	
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71580	Restore Arm & Hub Assem.	61	70167	Auto. Clear Disengaging Lever	
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71590	Mult. Key Release Shaft Crank			Assem. - Right	
	Assem.	55	75085	Shift Link Disengaging Lever	
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71610	Carriage Shift Gear Assem. . .	72		Assem. - Left	
71615	Carriage Shift Idler Gear Assem.	72	7033	6/0 x 1/2 Taper Pin	
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81014	#4 Mult. Setting Lever.	61	81315	Bracket for Escapement Pawl	
81015	#5 Mult. Setting Lever.	61		Disabling Slide	64
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81017	#7 Mult. Setting Lever.	61		Lock Assem.	63
81018	#8 Mult. Setting Lever.	61	81322	Guide Bracket for Position	
81023	Zero Keys Tie Rod	75		Selector	63
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	& Shaft Assem.	*74		Link Assem.	*63
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81140	Keyboard Clear Disabling		81344	Link - Constant Multiplier -	
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81830	Left Frame for Key Section Assem.	*74	81968	#8 Key Top - Brown	*53
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81835	Rear Key Section Support Assem.	74	84527	Selecting Bar Link Pivot Rod - Rear	*74
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81838	Keyboard Adjusting Link	*74	90006	Division Stop on Carriage	76
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	Retainer	76	90034	Retainer for Accumulator Clear Rack	
90553	Zero Stop Lever	76	90526	Accumulator Clear Rack Retainer	
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	Optional Clear Slide	77	90583	Bumper Bracket	
90583	Bumper Bracket	76	91740	Accumulator Clear Rack - Right	
90584	Optional Clear Slide Stop	77	91745	Accumulator Clear Rack - Left	
91028	Bumper for Clear Racks - Right	76	2020	4-48 x 3/16 Fillister Head Screw	
91095	Transfer Lever Assem.	77	2025	4-48 x .200 Special Hex. Head Screw	
91197	Bracket for Carriage Shift Rack				
	Support	80	2187	6-32 Special Screw	
91200	Carriage Shift Rack Assem. -		4004	#4 Lock Washer	
	8 Bank	81	4060	Spring Clip	
91200-T	Carriage Shift Rack Assem. -		4205	Washer	
	10 Bank	81	5213	Stud	
91405	Carriage End Plate Assem. -		91510-T	Carriage Frames Assem. -	
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91413	Bumper Bracket for Counter			Complete Transfer	78
	Clear Rack	76	90017	Bracket for Accumulator Rack	
91415	Carriage Rail Brace Assem. -			Bumper	
	Right	77	90018	Bumper for Clear Racks	
91417	Carriage Rail Brace - Left -		90034	Retainer for Accumulator Clear Racks	
	8 Bank	77	90526	Accumulator Clear Rack Retainer	
91417-T	Carriage Rail Brace - Left -		91740	Accumulator Clear Rack - Right	
	10 Bank	77	91745-T	Accumulator Clear Rack - Left	
91427	Zero Tabulator Key Stem	77	2020	4-48 x 3/16 Fillister Head Screw	
91428	#1 to #9 Inclusive - Tabulator		2025	4-48 x .200 Special Hex. Head Screw	
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91429	Lock Bar for Tabulator Keys	77	2187	6-32 Special Screw	
91435	Actuating Arm Assem. for		4004	#4 Lock Washer	
	Counter Zero Stop	76	4060	Spring Clip	
91445	Carriage End Plate Assem. -		4205	Washer	
	Left	76	5213	Stud	
91450	Counter Dial Shaft Assem. - Odd	77	91525	Carriage Front Rail Assem. -	
91460	Counter Dial Shaft Assem. - Even	77		8 Bank Complete	77
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91480	Zero Tabulator Key Top	53	91428	#1 to #7 Tabulator Key Stems inclusive	
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91482	#2 Tabulator Key Top	53	91480	Zero Tabulator Key Top	
91483	#3 Tabulator Key Top	53	91481	#1 Tabulator Key Top	
91484	#4 Tabulator Key Top	53	91482	#2 Tabulator Key Top	
91485	#5 Tabulator Key Top	53	91483	#3 Tabulator Key Top	
91486	#6 Tabulator Key Top	53	91484	#4 Tabulator Key Top	
91487	#7 Tabulator Key Top	53	91485	#5 Tabulator Key Top	
91488	#8 Tabulator Key Top	53	91486	#6 Tabulator Key Top	
91489	#9 Tabulator Key Top	53	91487	#7 Tabulator Key Top	
91503	Carriage Stop Bumper - Left		91520	Carriage Rail Assem. - 8 Bank	
	Position - 8 Bank	77	91526	Dummy Sensing Finger	
91504	Tie Strap for Carriage Frames	78	1076	Spring	
91506	Carriage Cover Mounting		1107	Spring	
	Bracket - Right	76	2217	3-48 x .150 Fillister Head Screw	
91507	Carriage Cover Mounting		4003	#3 Lock Washer	
	Bracket - Left	76	91525-T	Carriage Front Rail Assem. -	
91510	Carriage Frames Assem. -			10 Bank	77
	8 Bank 7th Position -				
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	Bumper				

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91428	#1 to #9 Tabulator Key Stems inclusive		91547	Split Clearance Position Indicator	
91429	Lock Bar for Tabulator Keys		91590	Carriage Cover Latch Assem. - Right	
91480	Zero Tabulator Key Top		91595	Carriage Cover Latch Assem. - Left	
91481	#1 Tabulator Key Top		2013	2-56 Special Flat Head Screw	
91482	#2 Tabulator Key Top		2120	3-48 x .182 Special Screw	
91483	#3 Tabulator Key Top		2242	4-36 x 1/4 Oval Head Phillips Screw	
91484	#4 Tabulator Key Top		91542	Accumulator Decimal Pointer Bar - 8 Bank	53
91485	#5 Tabulator Key Top		91542-T	Accumulator Decimal Pointer Bar - 10 Bank	53
91486	#6 Tabulator Key Top		91543	Counter Decimal Pointer Bar - 8 Bank	53
91487	#7 Tabulator Key Top		91543-T	Counter Decimal Pointer Bar - 10 Bank	53
91488	#8 Tabulator Key Top		91544	Finger Guard - Right End	76
91489	#9 Tabulator Key Top		91547	Split Clearance Position Indicator	53
91520-T	Carriage Rail Assem. - 10 Bank		91549	Split Clearance Setting Lever	77
91526	Dummy Sensing Finger		91550	Accumulator Dial Shaft Assem. - Odd	77
1076	Spring		91553	Twirler Knob	78
1107	Spring		91560	Accumulator Dial Shaft Assem. - Even	77
2217	3-48 x .150 Fillister Head Screw		91561	Accumulator Dial	78
4003	#3 Lock Washer		91570	Accumulator Dial Shaft Assem. - Odd - Complete Transfer	78
91526	Dummy Sensing Finger	77	91580	Accumulator Dial Shaft Assem. - Even - Complete Transfer	78
91527	Sensing Finger	77	91590	Carriage Cover Latch Assem. - Right	76
91528	Sensing Finger - Last Order	77	91595	Carriage Cover Latch Assem. - Left	76
91530	Counter Clear Rack	76	91601	Bail for Disabling Complete Transfer Gear	78
91531	Counter Clear Rack Stud	76	91602	Bail for Disabling Complete Transfer Gear	78
91536	Optional Clear Setting Lever - Counter	76	91603	Bail for Complete Transfer Blockout	78
91537	Optional Clear Setting Lever - Accumulator	76	91604	Shaft for Transfer Blockout - 8 Bank	78
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91539	Decimal Pointer for Counter Dials	53	91606	Complete Transfer Plate	78
91540	Carriage Cover Assem. - 8 Bank 7th Position	53	91607	Complete Transfer Support	78
91538	Decimal Pointer for Accumulator Dials		91610	Idle Gear Bracket Assem.	78
91539	Decimal Pointer for Counter Dials		91612	Complete Transfer Idler Gear - Upper	78
91542	Accumulator Decimal Pointer Bar - 8 Bank		91613	Complete Transfer Idler Gear - Lower	78
91543	Counter Decimal Pointer Bar - 8 Bank		91615	Zero Stop Slide Assem. - Accum. - 10 Bank - Complete Transfer	78
91547	Split Clearance Position Indicator				
91590	Carriage Cover Latch Assem. - Right				
91595	Carriage Cover Latch Assem. - Left				
2013	2-56 Special Flat Head Screw				
2120	3-48 x .182 Special Screw				
2242	4-36 x 1/4 Oval Head Phillips Screw				
91540-T	Carriage Cover Assem. - 10 Bank 7th Position	53			
91538	Decimal Pointer for Accumulator Dials				
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91640	Accumulator Dial Shaft Assem. - 8 Bank Only - Complete Transfer	78	90018	Bumper for Clear Racks	
91655	Optional Clear Slide Assem. . .	77	90034	Retainer for Accumulator Clear Rack	
91662	Split Clear Latch Disabling Slide	81	90526	Accumulator Clear Rack Retainer	
91663	Split Clear Latch Disabling Slide	81	90583	Bumper Bracket	
91665	Split Clear Latch Assem.	79	91750	Accumulator Clear Rack - Right	
91670	Split Clear Setting Knob Bracket Assem.	79	91755	Accumulator Clear Rack - Left - 8 Bank	
91675	Split Clear Latch Assem.	77	2020	4-48 x 3/16 Fillister Head Screw	
91680	Split Clear Setting Knob Bracket Assem.	77	2025	4-48 x .200 Special Hex. Head Screw	
<u>91710</u>	Carriage Frames Assem. - 8 Bank - 7th Position	76	2187	6-32 Special Screw	
90017	Bracket for Accumulator Rack Bumper		2220	Tie Screw for Carriage Frames	
90018	Bumper for Clear Racks		4004	#4 Lock Washer	
90034	Retainer for Accumulator Clear Rack		4060	Spring Clip	
90526	Accumulator Clear Rack Retainer		4205	Washer .	
90583	Bumper Bracket		5213	Stud	
91740	Accumulator Clear Rack - Right		<u>91715-T</u>	Carriage Frames Assem. - 10 Bank 8th Position Complete Transfer	78
91745	Accumulator Clear Rack - Left - 8 Bank		90017	Bracket for Accumulator Rack Bumper	
2020	4-48 x 3/16 Fillister Head Screw		90018	Bumper for Clear Racks	
2025	4-48 x .200 Special Hex. Head Screw		90034	Retainer for Accumulator Clear Rack	
2187	6-32 Special Screw		90526	Accumulator Clear Rack Retainer	
4004	#4 Lock Washer		90583	Bumper Bracket	
4060	Spring Clip		91750	Accumulator Clear Rack - Right	
4205	Washer		91755-T	Accumulator Clear Rack - Left - 10 Bank	
5213	Stud		2020	4-48 x 3/16 Fillister Head Screw	
<u>91710-T</u>	Carriage Frames Assem. - 10 Bank - 7th Position	76	2025	4-48 x .200 Special Hex. Head Screw	
90017	Bracket for Accumulator Rack Bumper		2187	6-32 Special Screw	
90018	Bumper for Clear Racks		2220	Tie Screw for Carriage Frames	
90034	Retainer for Accumulator Clear Rack		4004	#4 Lock Washer	
90526	Accumulator Clear Rack Retainer		4060	Spring Clip	
90583	Bumper Bracket		4205	Washer	
91740	Accumulator Clear Rack - Right		5213	Stud	
91745-T	Accumulator Clear Rack - Left 10 Bank		<u>91720</u>	Carriage Frames Assem. - 8 Bank 8th Position	76
2020	4-48 x 3/16 Fillister Head Screw		90017	Bracket for Accumulator Rack Bumper	
2025	4-48 x .200 Special Hex. Head Screw		90018	Bumper for Clear Racks	
2187	6-32 Special Screw		90034	Retainer for Accumulator Clear Rack	
4004	#4 Lock Washer		90526	Accumulator Clear Rack Retainer	
4060	Spring Clip		90583	Bumper Bracket	
4205	Washer		91750	Accumulator Clear Rack - Right	
5213	Stud		91755	Accumulator Clear Rack - Left - 8 Bank	
<u>91715</u>	Carriage Frames Assem. - 8 Bank 8th Position - Complete Transfer	78	2020	4-48 x 3/16 Fillister Head Screw	
			2025	4-48 x .200 Special Hex. Head Screw	
			2187	6-32 Special Screw	

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4060	Spring Clip		2187	6-32 Special Screw	
4205	Washer		2220	Tie Screw for Carriage Frames	
5213	Stud		4004	#4 Lock Washer	
91720-T	Carriage Frames Assem. - 10 Bank 8th Position	76	4060	Spring Clip	
90017	Bracket for Accumulator Rack Bumper		4205	Washer	
90018	Bumper for Clear Racks		5213	Stud	
90034	Retainer for Accumulator Clear Rack		91730	Carriage Frames Assem. - 8 Bank - 9th Position.	76
90526	Accumulator Clear Rack Retainer		90017	Bracket for Accumulator Rack Bumper	
90583	Bumper Bracket		90018	Bumper for Clear Racks	
91750	Accumulator Clear Rack - Right		90034	Retainer for Accumulator Clear Rack	
91755-T	Accumulator Clear Rack - Left - 10 Bank		90526	Accumulator Clear Rack Retainer	
2020	4-48 x 3/16 Fillister Head Screw		90583	Bumper Bracket	
2025	4-48 x .200 Special Hex. Head Screw		91760	Accumulator Clear Rack - Right	
2187	6-32 Special Screw		91765	Accumulator Clear Rack - Left - 8 Bank	
4004	#4 Lock Washer		2020	4-48 x 3/16 Fillister Head Screw	
4060	Spring Clip		2025	4-48 x .200 Special Hex. Head Screw	
4205	Washer		2187	6-32 Special Screw	
5213	Stud		4004	#4 Lock Washer	
91725	Carriage Frames Assem. - 8 Bank 9th Position - Complete Transfer Complete Transfer	78	4060	Spring Clip	
90017	Bracket for Accumulator Rack Bumper		4205	Washer	
90018	Bumper for Clear Racks		5213	Stud	
90034	Retainer for Accumulator Clear Rack		91730-T	Carriage Frames Assem. - 10 Bank 9th Position	76
90526	Accumulator Clear Rack Retainer		90017	Bracket for Accumulator Rack Bumper	
90583	Bumper Bracket		90018	Bumper for Clear Racks	
91760	Accumulator Clear Rack - Right		90034	Retainer for Accumulator Clear Rack	
91765	Accumulator Clear Rack - Left - 8 Bank		90526	Accumulator Clear Rack Retainer	
2020	4-48 x 3/16 Fillister Head Screw		90583	Bumper Bracket	
2025	4-48 x .200 Special Hex. Head Screw		91760	Accumulator Clear Rack - Right	
2187	6-32 Special Screw		91765-T	Accumulator Clear Rack - Left - 10 Bank	
2220	Tie Screw for Carriage Frames		2020	4-48 x 3/16 Fillister Head Screw	
4004	#4 Lock Washer		2025	4-48 x .200 Special Hex. Head Screw	
4060	Spring Clip		2187	6-32 Special Screw	
4205	Washer		4004	#4 Lock Washer	
5213	Stud		4060	Spring Clip	
91725-T	Carriage Frames Assem. - 10 Bank 9th Position - Complete Transfer	78	4205	Washer	
90017	Bracket for Accumulator Rack Bumper		5213	Stud	
90018	Bumper for Clear Racks		91740	Accumulator Clear Rack - Right - 7th Position.	76
90034	Retainer for Accumulator Clear Rack		91745	Accumulator Clear Rack - Left - 8 Bank - 7th Position	76
90526	Accumulator Clear Rack Retainer		91745-T	Accumulator Clear Rack - Left - 10 Bank - 7th Position	76
90583	Bumper Bracket		91750	Accumulator Clear Rack - Right - 8th Position	76
91760	Accumulator Clear Rack - Right		91755	Accumulator Clear Rack - Left - 8 Bank - 8th Position	76
91765-T	Accumulator Clear Rack - Left - 10 Bank				
2020	4-48 x 3/16 Fillister Head Screw				

FRIDEN CALCULATING MACHINE CO., INC.
PARTS LIST

6-15-50

MODEL STW

PART NO	PART NAME	SEE PAGE	PART NO.	PART NAME	SEE PAGE
91755-T	Accumulator Clear Rack - Left - 10 Bank - 8th Position	76	91790-T	Carriage Cover Assem. - 10 Bank - 9th Position	53
91760	Accumulator Clear Rack - Right - 9th Position	76	91538	Decimal Pointer for Accumulator Dials	
91765	Accumulator Clear Rack - Left - 8 Bank - 9th Position.	76	91539	Decimal Pointer for Counter Dials	
91765-T	Accumulator Clear Rack - Left - 10 Bank - 9th Position	76	91542-T	Accumulator Decimal Pointer Bar - 10 Bank	
91780	Carriage Cover Assem. - 8 Bank - 8th Position	53	91543-T	Counter Decimal Pointer Bar - 10 Bank	
91538	Decimal Pointer for Accumulator Dials		91547	Split Clearance Position Indicator	
91539	Decimal Pointer for Counter Dials		91590	Carriage Cover Latch Assem. - Right	
91542	Accumulator Decimal Pointer Bar - 8 Bank		91595	Carriage Cover Latch Assem. - Left	
91543	Counter Decimal Pointer Bar - 8 Bank		2013	2-56 Special Flat Head Screw	
91547	Split Clearance Position Indicator		2120	3-48 x .182 Special Screw	
91590	Carriage Cover Latch Assem. - Right		2242	4-36 x 1/4 Oval Head Phillips Screw	
91595	Carriage Cover Latch Assem. - Left		94018	Carriage Stop Bumper - Left - 10 Bank	77
2013	2-56 Special Flat Head Screw		94019	Carriage Stop Bumper - Right .	77
2120	3-48 x .182 Special Screw		94200	Carriage Shift Rack Assem. - 8 Bank	77
2242	4-36 x 1/4 Oval Head Phillips Screw		94200-T	Carriage Shift Rack Assem. - 10 Bank	77
91780-T	Carriage Cover Assem. - 10 Bank - 8th Position	53	94538	Counter Clear Rack Roller - Center	76
91538	Decimal Pointer for Accumulator Dials		94539	Counter Clear Rack Roller - Right & Left Ends	76
91539	Decimal Pointer for Counter Dials				
91542-T	Accumulator Decimal Pointer Bar - 10 Bank				
91543-T	Counter Decimal Pointer Bar - 10 Bank				
91547	Split Clearance Position Indicator				
91590	Carriage Cover Latch Assem. - Right				
91595	Carriage Cover Latch Assem. - Left				
2013	2-56 Special Flat Head Screw				
2120	3-48 x .182 Special Screw				
2242	4-36 x 1/4 Oval Head Phillips Screw				
91790	Carriage Cover Assem. - 8 Bank - 9th Position	53			
91538	Decimal Pointer for Accumulator Dials				
91539	Decimal Pointer for Counter Dials				
91542	Accumulator Decimal Pointer Bar - 8 Bank				
91543	Counter Decimal Pointer Bar - 8 Bank				
91547	Split Clearance Position Indicator				
91590	Carriage Cover Latch Assem. - Right				
91595	Carriage Cover Latch Assem. - Left				
2013	2-56 Special Flat Head Screw				
2120	3-48 x .182 Special Screw				
2242	4-36 x 1/4 Oval Head Phillips Screw				

FRIDEN CALCULATING MACHINE TEST

This test is to be used with Form 73-7 Calculator Unpacking Inspection Record which is enclosed with each Calculator. When a Friden Calculator is received from the Factory, it should be tested by a qualified member of the Service Department. Discrepancies that are found are to be recorded under the proper Item on Form 73-7 which is to be returned to the General Service Department at San Leandro. If no discrepancy is recorded - do not return Form 73-7. Use this test for testing a machine which has been repaired.

ITEM 1 COVERS

Check the condition of the paint, the fit of the covers and check for dents or damage.

ITEM 2 ELECTRICAL

Without a selection in the Keyboard and the Add Key up, depress the Plus Key to close the Micro Switch. Check for the proper operation of the switch and motor.

ITEMS 3-4 MAIN KEYBOARD KEYS & KEYBOARD COLUMN LOCKS

Depress all "9" Keys. Release each "9" Key by slowly depressing each column Clear Key; then follow by depressing all "8" Keys and releasing, all "7" Keys and releasing, etc. Next depress all "9" Keys; pull up all Separate Column Lock Keys; try Keyboard Clear Key; also, try to depress other numeral keys in each column. All columns should remain locked. Clear each column with Separate Column Clear Keys; depress all "1" Keys; clear with Keyboard Clear Key, and all Keys should clear.

ITEMS 5-6 SELECTION & ONE CYCLE ADD

With Add Key down, check to see that all keys release with Plus and Minus Keys.

Note: Hold the Plus Key and the Minus Key down for an instant after each operation. The machine should not make more than one revolution. Release the Key slowly and redepress to check for clutch releasing.

KEYBOARD	DEPRESS CARRIAGE CLEAR	UPPER DIALS	LOWER DIALS
9 9 9 9 9 9 9 9 9 9	Plus Bar	9 9 9 9 9 9 9 9 9 9	1
8 8 8 8 8 8 8 8 8 8	" "	1 8 8 8 8 8 8 8 8 8 7	2
7 7 7 7 7 7 7 7 7 7	" "	2 6 6 6 6 6 6 6 6 6 4	3
6 6 6 6 6 6 6 6 6 6	" "	3 3 3 3 3 3 3 3 3 3 0	4
5 5 5 5 5 5 5 5 5 5	" "	3 8 8 8 8 8 8 8 8 8 5	5
4 4 4 4 4 4 4 4 4 4	" "	4 3 3 3 3 3 3 3 3 3 2 9	6
3 3 3 3 3 3 3 3 3 3	" "	4 6 6 6 6 6 6 6 6 6 2	7
2 2 2 2 2 2 2 2 2 2	" "	4 8 8 8 8 8 8 8 8 8 4	8
1 1 1 1 1 1 1 1 1 1	" "	4 9 9 9 9 9 9 9 9 9 5	9
1 1 1 1 1 1 1 1 1 1	Minus Bar	4 8 8 8 8 8 8 8 8 8 4	8
2 2 2 2 2 2 2 2 2 2	" "	4 6 6 6 6 6 6 6 6 6 2	7
3 3 3 3 3 3 3 3 3 3	" "	4 3 3 3 3 3 3 3 3 3 2 9	6
4 4 4 4 4 4 4 4 4 4	" "	3 8 8 8 8 8 8 8 8 8 5	5
5 5 5 5 5 5 5 5 5 5	" "	3 3 3 3 3 3 3 3 3 3 0	4
6 6 6 6 6 6 6 6 6 6	" "	2 6 6 6 6 6 6 6 6 6 4	3
7 7 7 7 7 7 7 7 7 7	" "	1 8 8 8 8 8 8 8 8 8 7	2
8 8 8 8 8 8 8 8 8 8	" "	9 9 9 9 9 9 9 9 9 9	1
9 9 9 9 9 9 9 9 9 9	" "	0 0 0 0 0 0 0 0 0 0	0

FRIDEN CALCULATING MACHINE CO., INC.

FRIDEN CALCULATING MACHINE TESTITEM 7 AUTO. KEYBOARD CLEAR

With Add Key down, check the machine in all operations. The Keyboard should only clear at the completion of every operation except Multiplier Clear. With the Add Key up, the machine should not clear the Keyboard in any operation. The Keyboard should also not clear during any operation when the Add Key is down.

ITEM 8 COUNTER

Make the Multiplication test below by using the Plus and the Minus Keys: Check the Lower Dials closely to see that each Lower Dial registers correctly on each stroke. Plus 10X means Plus 10 individual strokes on the Plus Key. Plus or Minus 9X means Plus or Minus 9 times. Do not hold the Plus or Minus Keys down, but make separate strokes.

ADD KEY UP		SET ON KEYBOARD 1123454321	
CARRIAGE POSITION	DEPRESS CARRIAGE CLEAR	UPPER DIALS	LOWER DIALS
1	Plus 10X	11234543210	10
2	" 9X	112345432100	100
3	" 9X	1123454321000	1000
4	" 9X	11234543210000	10000
5	" 9X	112345432100000	100000
6	" 9X	1123454321000000	1000000
7	" 9X	11234543210000000	10000000
8	" 9X	112345432100000000	100000000
9	" 9X	1123454321000000000	1000000000
10	" 9X	11234543210000000000	10000000000
10	Minus 9X	11234543210000000000	10000000000
9	" 9X	11234543210000000000	1000000000
8	" 9X	112345432100000000	10000000
7	" 9X	11234543210000000	1000000
6	" 9X	1123454321000000	100000
5	" 9X	112345432100000	10000
4	" 9X	11234543210000	1000
3	" 9X	1123454321000	100
2	" 9X	11234543210	10
1	" 9X	0000000000	00

OTHER COUNTER TESTS

Place a finger at the left end of Counter Shaft and push with some pressure to the right. Depress and hold the Minus Key for a few revolutions, then use the Plus Key. Place a finger at the right end of the Counter Shaft and push with some pressure to the left. Again use the Plus and the Minus Keys. The Counter Dial operated by the #1 Primary finger should not fail to rotate. Shift the Carriage to the second position and repeat the above test. Try the test in all Carriage positions.

(continued)

FRIDEN CALCULATING MACHINE TEST

(Counter Tests continued)

With the Carriage in first position and the Dials clear, depress the Minus Key for placing all 9's in the Counter Dials. Turn the next to last Dial to a #8. Next, for one cycle at a time, rapidly depress the Plus Key then the Minus Key. The Dial to the left of the 8 should show no movement. Turn this 8 to a 9 and move the 8 to the next Dial to the right. Repeat the test with the Plus and Minus Keys. Continue to move the 8 to the right.

Place all 9's in the Counter Dials, have Add Key down and shift the Carriage to the last position. Turn the next to the last dial to an 8. Place 2 1 in the first Keyboard column. Depress the Division Keys. Observe, as the machine is Dividing, that the Dial to the left of the 8 shows no movement.

Repeat the test by shifting the Carriage back to the next to last position and moving the 8 to the next Dial to the right and turning the first 8 to a 9. Repeat the Division test. Continue to move the 8 to the right.

ITEM 9

EXTRA TRANSFER

Repeat each operation several times in each Carriage position. Listen for the Bell to ring on both Minus and Plus operations. Note if the Bell fails to ring in any Carriage position.

ADD KEY UP

KEYBOARD: 1 Locked in			
CARRIAGE POSITION	DEPRESS CARRIAGE CLEAR	UPPER DIALS	LOWER DIALS
1	Minus Plus	9999999999999999 All Zeros	999999999999 All Zeros
2	Minus Plus	9999999999999990 All Zeros	999999999990 All Zeros
3	Minus Plus	9999999999999900 All Zeros	999999999900 All Zeros
4	Minus Plus	99999999999999000 All Zeros	9999999999000 All Zeros
5	Minus Plus	999999999999990000 All Zeros	99999999990000 All Zeros
6	Minus Plus	9999999999999900000 All Zeros	999999999900000 All Zeros
7	Minus Plus	99999999999999000000 All Zeros	9999999999000000 All Zeros

FRIDEN CALCULATING MACHINE CO., INC.

FRIDEN CALCULATING MACHINE TESTITEM 10 FULL CARRY OVER

Make the following test and see that the Transfer is complete in all Carriage Positions.

SET 1 on KEYBOARD, LOCK IN

MULTIPLIER KEYBOARD	DEPRESS	UPPER DIALS	LOWER DIALS
1	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	99999999999999999999 All Zeros	99999999999 All Zeros
10	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	99999999999999999990 All Zeros	999999999990 All Zeros
100	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	99999999999999999900 All Zeros	999999999900 All Zeros
1000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	999999999999999999000 All Zeros	999999999000 All Zeros
10000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	9999999999999999990000 All Zeros	9999999990000 All Zeros
100000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	99999999999999999900000 All Zeros	99999999900000 All Zeros
1000000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	999999999999999999000000 All Zeros	999999999000000 All Zeros
10000000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	9999999999999999990000000 All Zeros	9999999990000000 All Zeros
100000000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	99999999999999999900000000 All Zeros	99999999900000000 All Zeros
1000000000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	999999999999999999000000000 All Zeros	999999999000000000 All Zeros
10000000000	Rep. Mult. Neg. Mult. Accum. Mult. Clear Rep. Mult.	9999999999999999990000000000 All Zeros	9999999990000000000 All Zeros

FRIDEN CALCULATING MACHINE TEST

ITEM 11

OPERATING BARS

Depress each of the following Controls several times and check for sticking, touching cover slots, proper operation, etc.:

Plus Key	Left Shift	Left Div.	K. B. Clear
Minus Key	Right Shift	Stop Key	K. B. Lock
Enter Div'd	Add Key	Right Div.	Counter Control
Mult.	Neg. Mult.	Both Div.	Mult. Non-Entry
Mult. Clear	Accum. Mult.	Carr. Clear	Repeat Mult.

Depress each Tabulation Key from one to eight, making sure that each key remains down and restores the key which was already down. Starting with the Zero Tab. Key, depress Enter Div'd Key and check for the proper Carriage Tabulation; then the #1 Tab. Key, #2 Tab. Key, etc., until all Tab. Keys are checked for proper operation and proper Dividend entry.

Work any Multiplication problem to prove proper action of Multiplier Keyboard, Multiplier Correction Key, Accumulative Multiplier Key, Negative Multiplier Key, and Repeat Multiplication.

ITEM 12

CARRIAGE SHIFT

Using the Shift Keys, make sure the Carriage shifts freely into each position, both from Left to Right and from Right to Left. Make sure the Shift Keys do not bind, rub on the cover, etc. Hold the Keys down and also use individual depressions.

Work any 10 digits in Keyboard by 10 digit Multiplier and check for proper Automatic Carriage Shift. Work any 20 digits by 10 digits in Division and check for proper Automatic Carriage Shift, both to the Right and Left.

ITEM 13

POWER SHIFT ACT. MECH.

Shift the Carriage to the extreme Right. Check for the proper operation of the Power Shift Actuating Mechanism by depressing the Carriage Clear Key. Observe that the Carriage begins to shift on the second cycle of the machine. If the Carriage is hesitating at the start or skips a shift now and then, this denotes that the Power Shift Actuating Mechanism is not latching or is not functioning properly. Test this action on each operating Key which returns the Carriage to first position.

ITEM 14

AUTO. CARRIAGE CLEAR

Enter figures into the Upper and Lower Dials. Shift the Carriage to the right, depress the Carriage Clear Key. Observe the proper clearance of the Dials when the Carriage returns to first position. Test with the Multiplier Key also.

ITEMS 15-16

CARRIAGE CLEAR RACKS & SPLIT & NORMAL CLEARANCE

Try Optional Clear and Split Clear Knobs in both positions and check for freeness, proper detent action, rubbing on Cover, etc. Manually clear the Dials; check for proper clearing action. All Upper Dials should clear when the Left Half of Clear Rack is locked in, but only to the position of the Split (7th, 8th, 9th) if Left Half of the Clear Rack is not locked in.

FRIDEN CALCULATING MACHINE CO., INC.

FRIDEN CALCULATING MACHINE TESTITEMS 17-18- ENTER DIVIDEND: DIVISION ALIGNMENT: DIVISION

19 Work the following problems, and check the action of Enter Dividend, the proper Entry and the Division results. Check that the Division Aligner functions properly by shifting the Carriage back to position #1 after each Enter Dividend operation and before depressing the Division Keys. The Carriage should automatically shift to the right until the figures are aligned.

Use #9 Tab. Key first, then #8, #7, etc. to test in all Carriage positions.

KEYBOARD	DEPRESS	UPPER DIALS	LOWER DIALS
8888888888 9999999999	Div. Tab. Left Shift Both Div.	88888888880000000000 8888888888	8888888888
7777777777 9999999999	Div. Tab. Left Shift Both Div.	77777777770000000000 7777777777	7777777777
6666666666 9999999999	Div. Tab. Left Shift Both Div.	66666666660000000000 6666666666	6666666666
5555555555 9999999999	Div. Tab. Left Shift Both Div.	55555555550000000000 5555555555	5555555555
4444444444 9999999999	Div. Tab. Left Shift Both Div.	44444444440000000000 4444444444	4444444444
3333333333 9999999999	Div. Tab. Left Shift Both Div.	33333333330000000000 3333333333	3333333333
2222222222 9999999999	Div. Tab. Left Shift Both Div.	22222222220000000000 2222222222	2222222222
1111111111 9999999999	Div. Tab. Left Shift Both Div.	11111111110000000000 1111111111	1111111111

FRIDEN CALCULATING MACHINE TEST

ITEM 20

AUTOMATIC TRANSFER

Work the following problem to test the transfer action. Other problems may also be used.

MNE down. Add Key down. Counter Clear and set in non-clearing position.				
KEYBOARD	MULTIPLIER KEYBOARD	DEPRESS	UPPER DIALS	LOWER DIALS
0000137000	2400	MULT. KEY	3288	ZERO
		BOTH TRANSFER KEYS	ZERO	3288
0000203000	5400	MULT. KEY	10962	3288
		BOTH TRANSFER KEYS	ZERO	14250
0014250000	07	MULT. KEY	9975	14250
		NEG. TRANSFER KEY	ZERO	13253

Test that the Selection Lever, which operates the transfer, restores after the operation. Do this by depressing the Plus and Minus Key after the Transfer Action, both Negative and Positive Transfer.

ITEM 21

MULTIPLIER KEYBOARD

Check for the proper action of the Selection Keys; the Sector releasing; the Pins setting; the time of Carriage escapement.

FRIDEN CALCULATING MACHINE CO., INC.

FRIDEN CALCULATING MACHINE TEST

ITEMS 22-23-24 AUTO. MULTIPLIER: MULTIPLIER CLEAR: REPEAT MULT.
 Work the following Multiplication test by using the Repeat Key.

ADD KEY UP
 SET 1111111111 ON KEYBOARD, LOCK IN

MULTIPLIER KEYBOARD	DEPRESS	UPPER DIALS	LOWER DIALS
1212121212	Rep. Mult. Mult. Key Neg. Mult. Clear Rep. Mult.	1346801346531986532 All Zeros	1212121212 All Zeros
2323232323	Rep. Mult. Accum. Mult. Neg. Mult. Clear Rep. Mult.	2581369247519640853 All Zeros	2323232323 All Zeros
3434343434	Rep. Mult. Mult. Key Neg. Mult. Clear Rep. Mult.	3815937148507295174 All Zeros	3434343434 All Zeros
4545454545	Rep. Mult. Accum. Mult. Neg. Mult. Clear Rep. Mult.	50505050494949495 All Zeros	4545454545 All Zeros
5656565656	Rep. Mult. Mult. Key Neg. Mult. Clear Rep. Mult.	6285072950482603816 All Zeros	5656565656 All Zeros
7878787878	Rep. Mult. Mult. Key Neg. Mult. Clear Rep. Mult.	8754208752457912458 All Zeros	7878787878 All Zeros
8989898989	Rep. Mult. Accum. Mult. Neg. Mult. Clear Rep. Mult.	9988776653445566779 All Zeros	8989898989 All Zeros

FRIDEN CALCULATING MACHINE TEST

- ITEM 25 SW - MULT. SETTING KEY
Work any multiplication problem by using the Mult. Setting Lever in all three positions. See that it restores properly and that the right multiplication is performed in each position.
- ITEM 26 M. N. E.
Work any multiplication problem with the MNE down. Check that the Counter Dials do not rotate. Divide out and check that the Counter Dials do rotate.
- ITEM 27 HALF CENT AND FRACTIONAL
Place all 9's in Keyboard. With Add Key up, depress Plus Key once. Turn all three Clear Knobs to non-clearing position. Place "1" in Multiplier Unit. Pull Repeat Key down. Depress Multiplier Key, then Negative Multiplier Key. The first and last Dials with numbers should change. Others show 9's.
Clear the Carriage in First position. Set 5's in all Half Cent or Fractional Dials. Observe that the Setting Twirler drops into position properly. Set "1" in Column 1 and depress the Division Keys. Observe that the Carriage aligns and divides out. Try this test with other figures in Fractional Dials.
- ITEM 28 SRW
See tests on Pages 32 and 33, SRW Manual.
- ITEM 29 AUTO. DIVISION STOP
With the #9 and #8 Tab. keys depressed, divide all 9's by 1's. The Carriage should stop automatically at the 8th position. Continue the test by depressing the #8 and #7 Tab. keys and divide 8's by 1's. The Carriage should stop automatically at the 7th position. Continue test by using Tab. keys 7 & 6, 6 & 5, 5 & 4, 4 & 3, 3 & 2, 2 & 1.
- ITEM 30 INTERLOCKS
Test interlocks by attempting to depress other operating keys during any operation.
- ITEM 31 SPRINGS
Record under this Item any difficulty caused by a faulty spring. Record unhooked springs, ruptured springs. Record by part number. Return damaged springs attached to Form 73-7.
- ITEM 32 BROKEN PARTS
Record under this Item any part that may be found broken. Record by part number. Return the parts attached to Form 73-7.
- ITEM 33 BINDING PARTS
If it is necessary to remove the covers, check the machine carefully for binding parts. Be specific when reporting such conditions by giving the proper numbers and locations of the parts in the machine. The reason for this condition can then be traced.
- ITEM 34 SCREWS & PINS
If it is necessary to remove the covers, check the machine carefully for loose screws, taper pins, nuts, clips, shavings, or other evidence of careless workmanship. Be specific when reporting such conditions by giving the proper number and locations of the parts in the machine. The reason for this condition can then be traced.

FRIDEN CALCULATING MACHINE CO., INC.

FRIDEN CALCULATING MACHINE TESTITEM 35LUBRICATION

If it is necessary to remove the covers, check and note that all parts requiring lubrication are properly lubricated. Record under this Item any discrepancy caused by improper lubrication.

ITEM 36DAMAGED IN SHIPMENT

Record under this Item any damage to the machine which might be due to rough handling, improper packing, or inadequate protection. If there is damage to the machine, always make a claim on the local office of the shipping company. Do this without delay. Record, also, any parts that may be found disengaged.

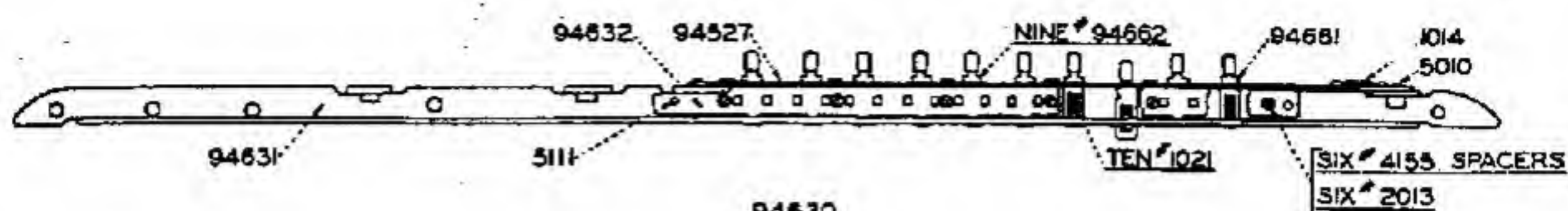
ITEM 37OTHER

Record under this Item any other discrepancies that are found which do not come under the Items listed.

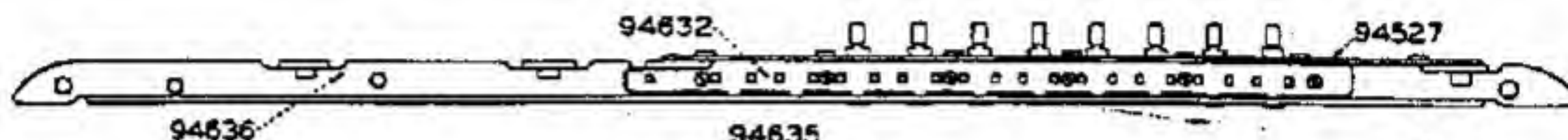
FRIDEN CALCULATING MACHINE CO., INC.

STEEL CARRIAGE FRONT RAILS

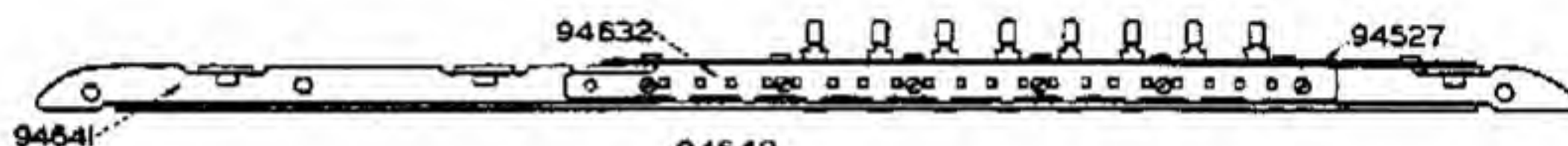
Gray Line Models



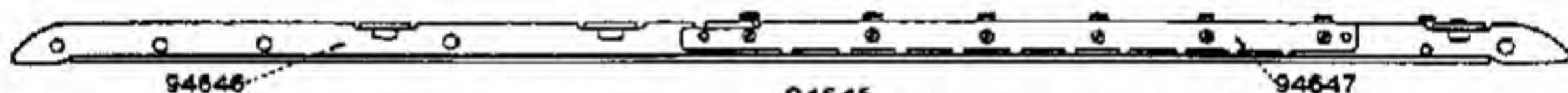
94630
MODEL C-10
MODEL FT-10
MODEL ST-10



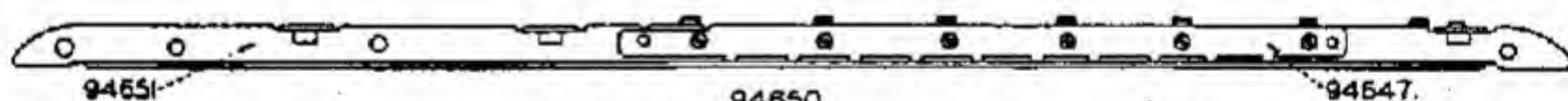
94635
MODEL ST-8



94640
MODEL C-8
MODEL FT-8



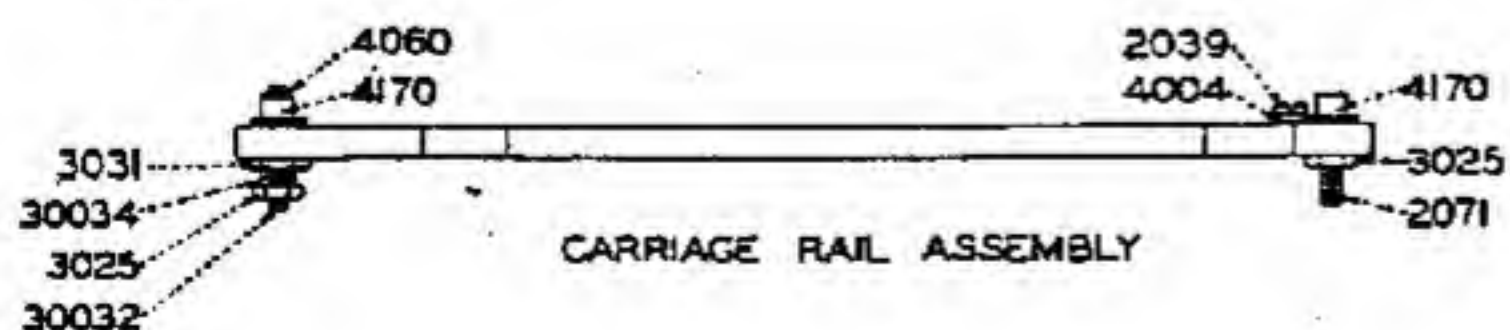
94645
MODEL DS-10
MODEL D-10
MODEL S-10



94650
MODEL S-8



94655
MODEL DS-8
MODEL D-8

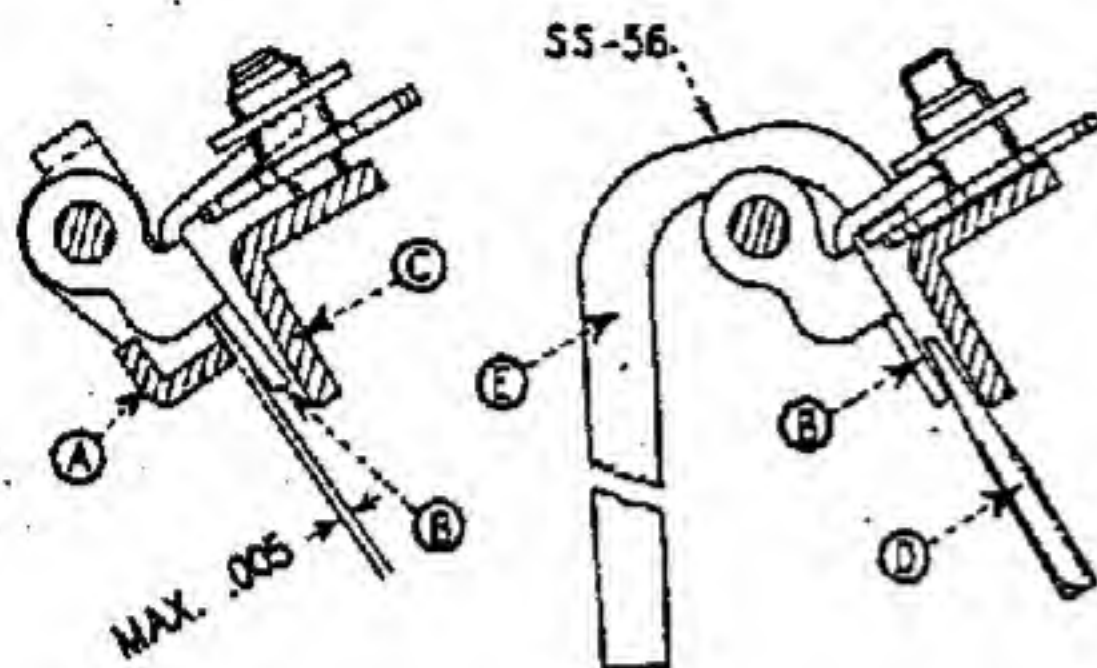


CARRIAGE RAIL ASSEMBLY

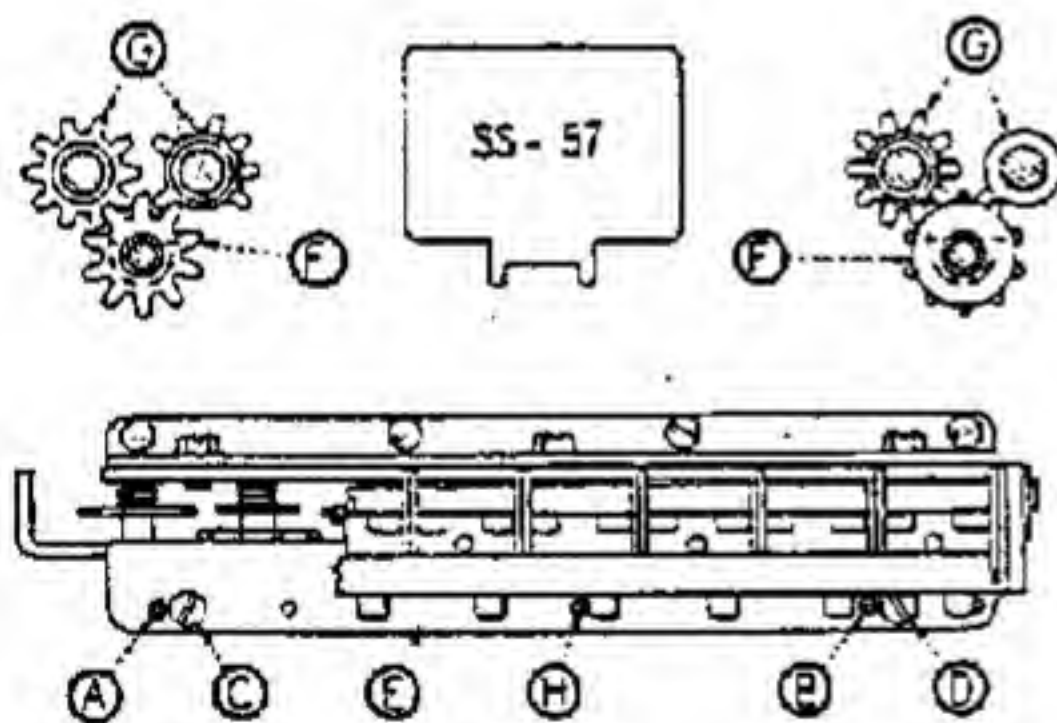


NEW TYPE COMPLETE TRANSFER, JF, ON ALL MACHINES FROM

SERIAL NO. STW-10-473331 CW-10-72161 DW-10-272115



1. **BAIL FOR DISABLING COMPLETE TRANSFER IDLER GEAR:** With Complete Transfer Blockout Bail A depressed manually, none of the Bails B should touch Bracket C and none should have more than .005 play in this position. This is to insure equal control of the Idler Gears. To Adjust, insert point of Screwdriver D or other suitable brace under lower tail of Bail B and using Forming Tool E, form upper tail of Bail B as shown at right.



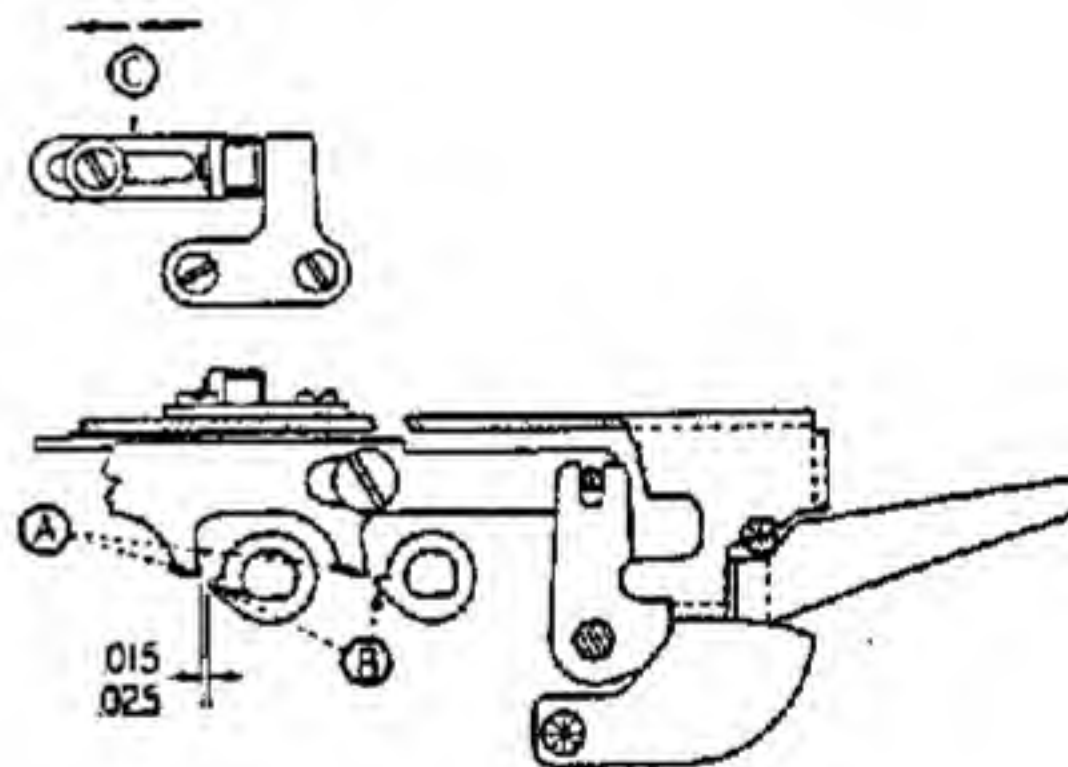
2. **COMPLETE TRANSFER IDLER GEAR SECTION:** There should be an equal amount of backlash or play in both Add and Subtract motions. This can be determined by turning #12 Dial slowly by Dial Wrench or in the machine by handcrank, and noting how the individual Dials pick up as the transfer motion progresses from the 12th Dial to the 20th Dial. If the Idler Gear Section is in too deep, there will be more backlash or play in Minus than in Plus. If the Idler Gear Section is not in deep enough, there will be more backlash or play in Plus than in Minus. Adjust as follows.

INWARD: Turn Allen Screws A, B and H outward and tighten Screws C and D a like amount.

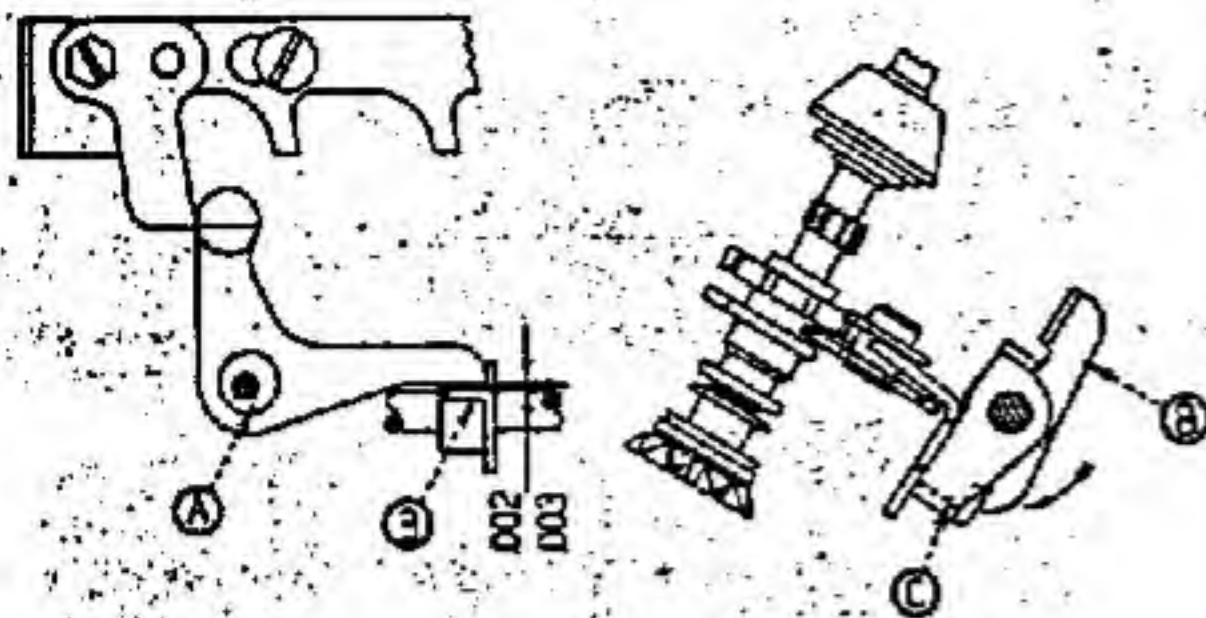
OUTWARD: Turn Screws C and D outward and tighten Screws A, B and H a like amount.

CAUTION: 1/12th of a turn of the adjusting Screws may be sufficient. Keep the Idler Gear Section Adjustment even. There should be an equal amount of backlash at both ends of the Idler Gear Section and it may be only necessary to adjust at one end. **TIGHTEN SCREWS C AND D VERY LIGHTLY** to prevent distortion of bracket E. It is not necessary to disturb upper bracket.

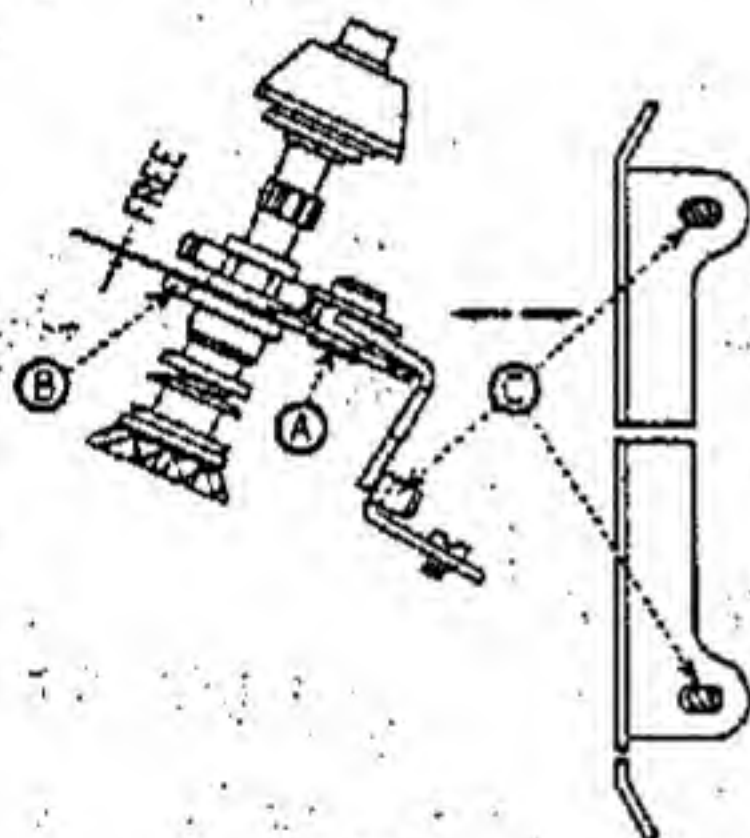
Shown in sketch are Idler Gears F and Transfer Gears G on the Product Dial Shafts. This illustrates how the Gears mesh together.



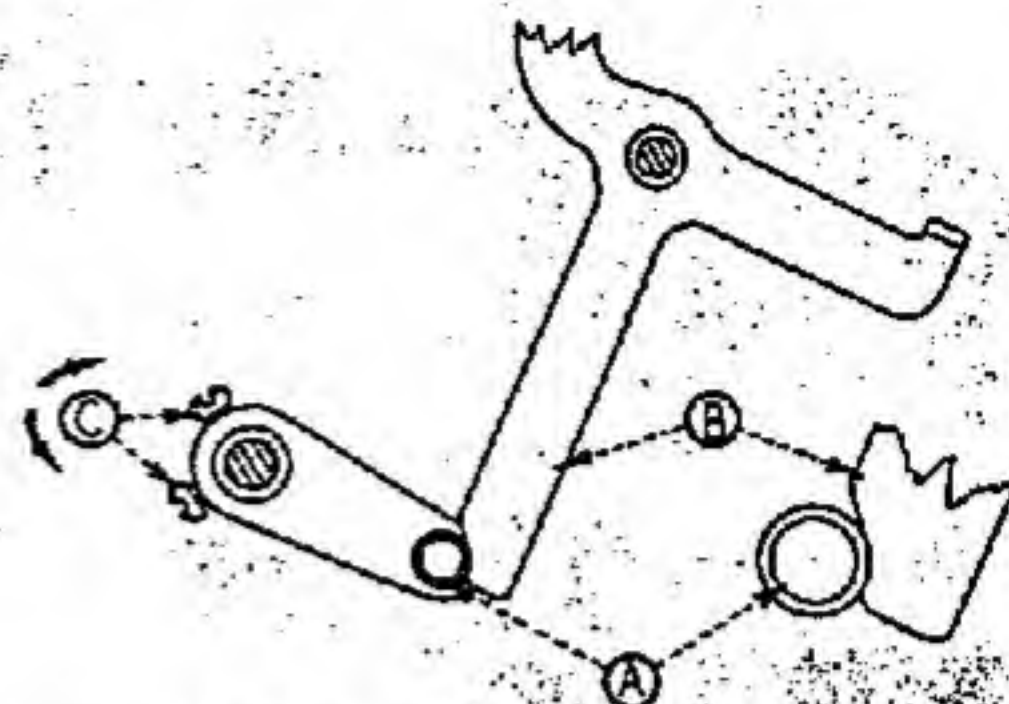
3. **ZERO STOP SLIDE:** In Home Position there should be .015 to .025 clearance between Points A on the Zero Stop Slide and Points B on the Zero Cams. Adjust at Stop C. After adjusting Stop C, for an STW machine check adjustments 37, 38, 40, 41, 42, 43, 46 in your STW Manual. For a CW machine check adjustments 35, 36, 39, 40, 41, 42, 45 in your CW-DW Manual. For a DW machine check adjustments 35, 37, 41, 42, 45 in your CW-DW Manual.



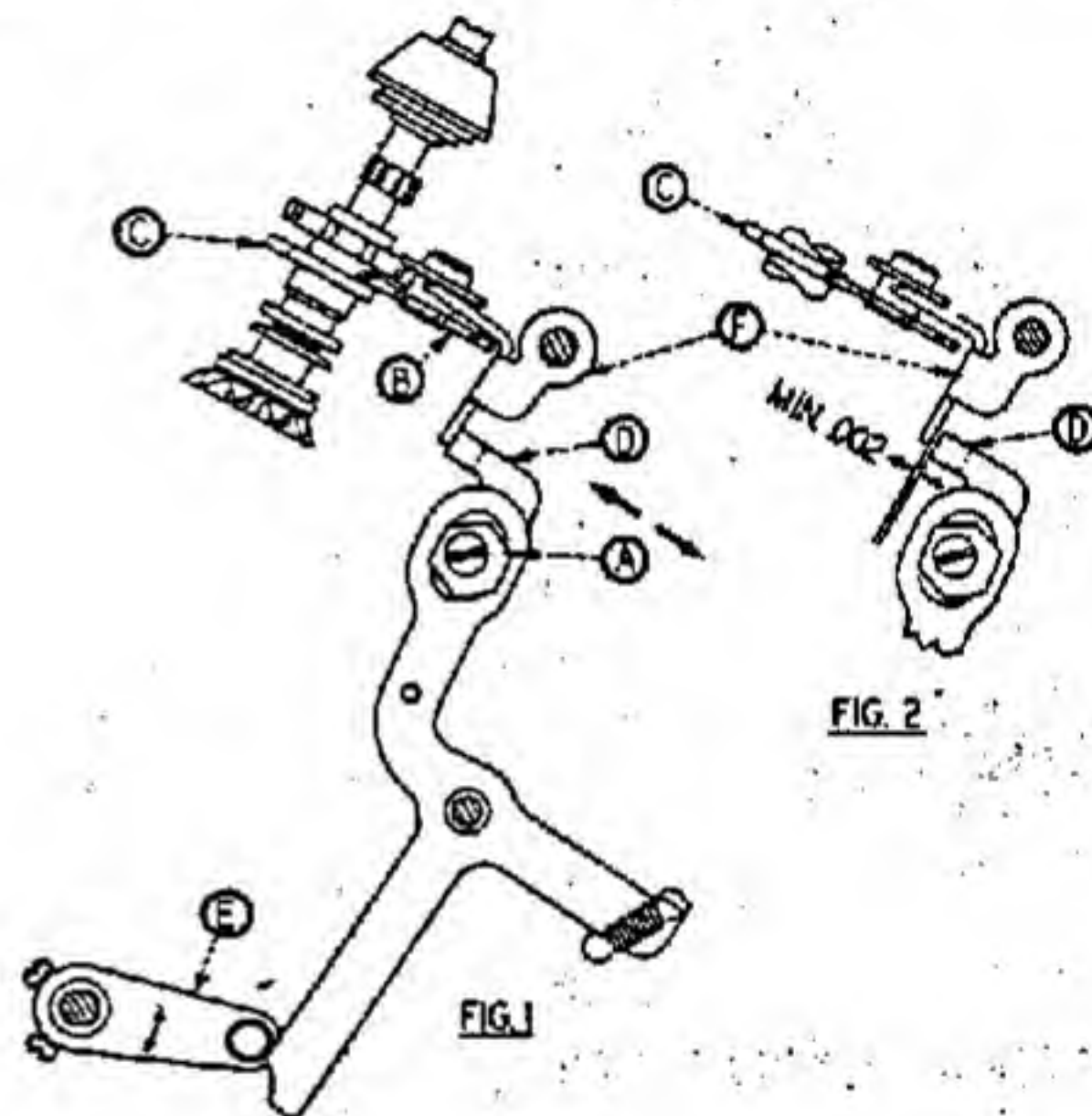
4. **DISABLER BELLCRANK:** With the Optional Clear Slide pulled all the way to the right adjust Eccentric A so that Lever B moves Disengaging Bail C rearward as far as possible without forcing. With the Optional Clear Slide in Home Position, there should be no pressure of Lever B against Disengaging Bail C. .002 to .003 clearance is preferable. A greater Gap may delay disengaging action. To check, put all 9's into carriage and clear by hand.



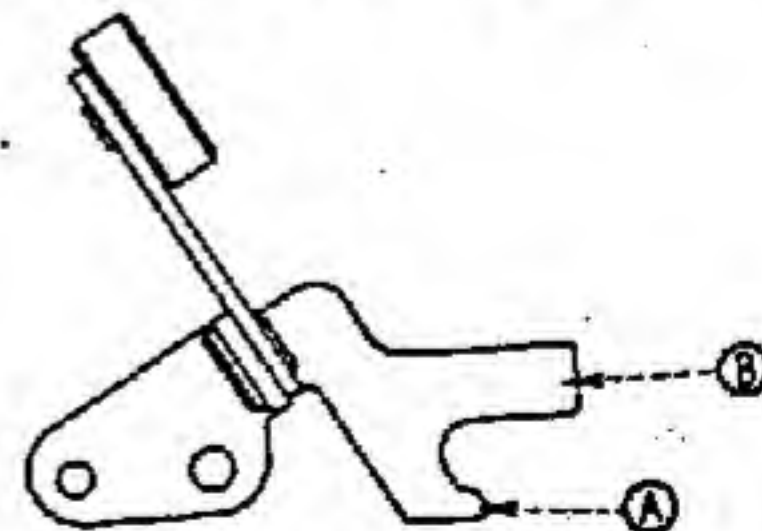
5. **COMPLETE TRANSFER BLOCKOUT-IN-BOARD ORDERS:** Carriage in extreme right position, all Idler Gears A should be disengaged from Transfer Gears B. Adjust by Blockout C. Blockout C should be moved rearward to raise Idler Gears A as high as possible without binding the Dials or the Carriage. If Gears A are too low, Dials will attempt to transfer.



6. **COMPLETE TRANSFER DISENGAGING ARM. (SEQUENCE ADJUSTMENT):** In Home Position Roller A should set in notch on Arm B as shown. Adjust at C.



7. **DISENGAGING ARM. (SECOND ADJUSTMENT):** With Division Key depressed, Lever D should raise Idler Gear B as high as possible without binding the Dials or the Carriage. This should be tried in all Carriage Positions. Adjust by Eccentric A. If Idler Gear B is too low, dials will attempt to transfer when spun. With Lever E in Home Position, there should be a minimum of .002 clearance between Lever D and Disengaging Finger F. (see Fig. 2).



8. **BELL TAPPER ASSEMBLY:** To adjust for proper ringing action when making an overdraft, form Tail A. To adjust Bell not to ring in Division, form Tail B.

TESTING PROCEDURE

To perform Detent and Pickup checks shift carriage to the last position. Turning Shift Gear By hand, position carriage half way between last position and next-to-last position.

DETENT CHECK: Turn Dials slightly out of centralized position and release to see that they return to center of detent. Failure to centralize easily may indicate Idler Gears are being held too high by Disengaging Mechanism. Also look for binds in Sensing Fingers and Dial Bearings.

PICKUP CHECK: Turn Dials backwards from 0 through 9 to 8 and back through 9 to 1. Do this several times. No flicker or attempt to transfer to the next dial to the left should be seen. A movement in the next dial to the left indicates Idler Gears are not being held high enough by the Disengaging Mechanism.

1. Make Pickup Check. If dials try to transfer, the Idler Gears are not being held high enough. See adjustment 5.

2. Try transferring Minus and Plus in all Carriage Positions with a 1 in the first column of the Main Keyboard. If any dials tend to spin or not transfer correctly, first check Carriage Adjustments and Geneva Clearances, and in particular, #12 Geneva. Do not attempt any adjustment to the Idler Gear Section until all other adjustments have been corrected.

3. Transfer 9's into Carriage and clear under power. If trouble develops here, see adjustments 3 and 4.

4. Transfer 9's in and out of Carriage using Negative Mult. followed by Accumulative Mult. under power. Do this a number of times.

5. Try Division with a 1 in the first column of the Main Keyboard. Shift Carriage to extreme right and Divide across. If Dials to the left of the blockout point tend to flicker or attempt to transfer, see adjustments 6 and 7.

NOTE: The following adjustments also affect Complete Transfer. #12 Geneva should be checked for clearance to the Cam on #6 Actuator. Keep adjustment close, not over .002 to .003 clearance.

Carriage Shift Rack adjustment should be kept close for perfect mesh of Add-Subtract Gears with Product Dial Gears. A little to the right or left may affect Complete Transfer Action.

A loose Carriage affects Complete Transfer.

To check the Carriage Shift Rack Adjustment, apply pressure to the Carriage, both to the right and then to the left while transferring 9's in and out of the Accumulator Dials. Do this in all Carriage Positions. If the Dials tend to falter or fail to transfer properly, the Shift Rack should be adjusted slightly in the direction indicated by this test. That is, if failure is noted when pressing the Carriage to the left, the Shift Rack should be moved slightly to the left to move the Carriage to the right.

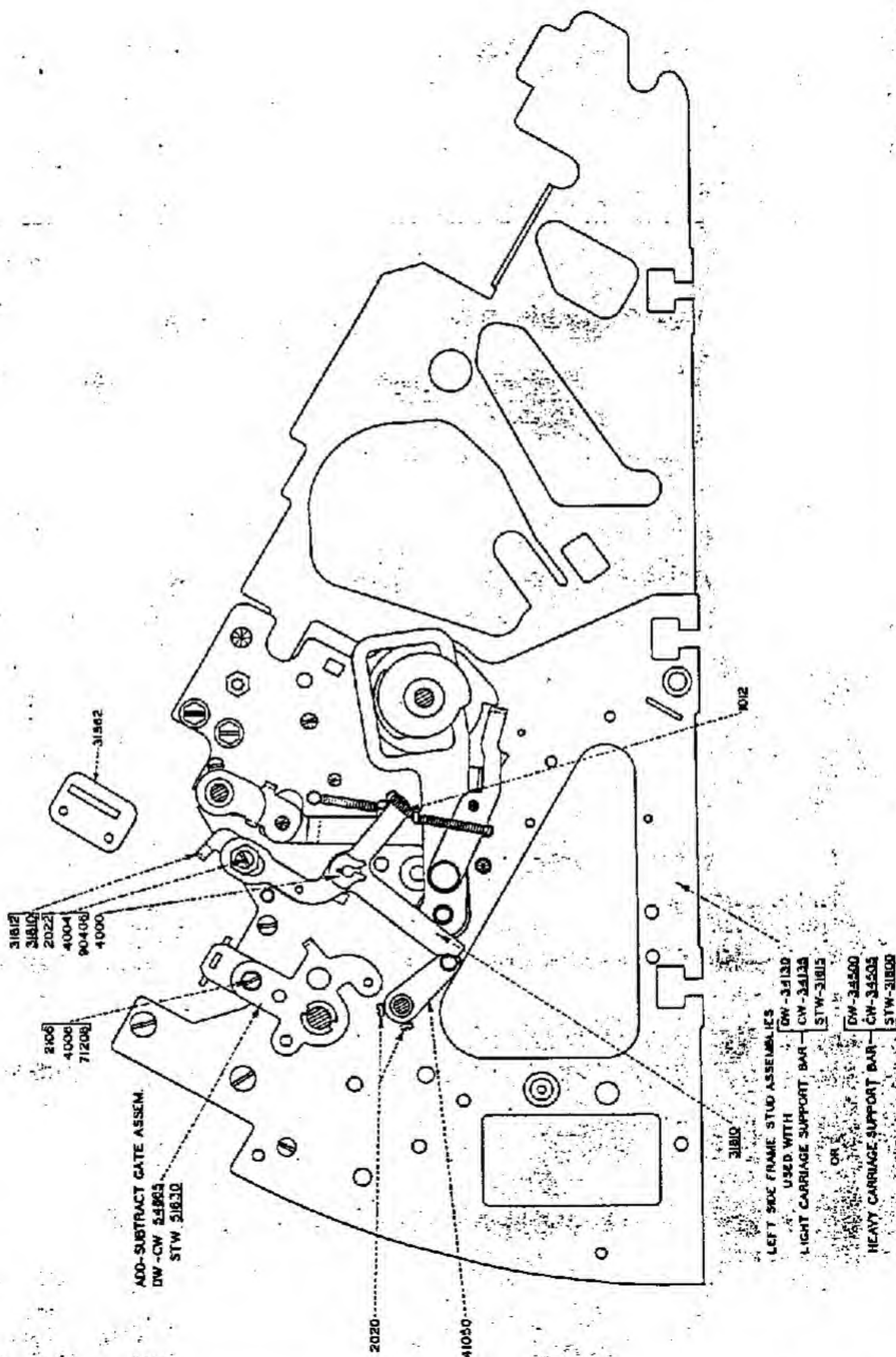
INSTRUCTIONS FOR CONVERTING OLD TYPE COMPLETE TRANSFER MACHINES
TO NEW TYPE:

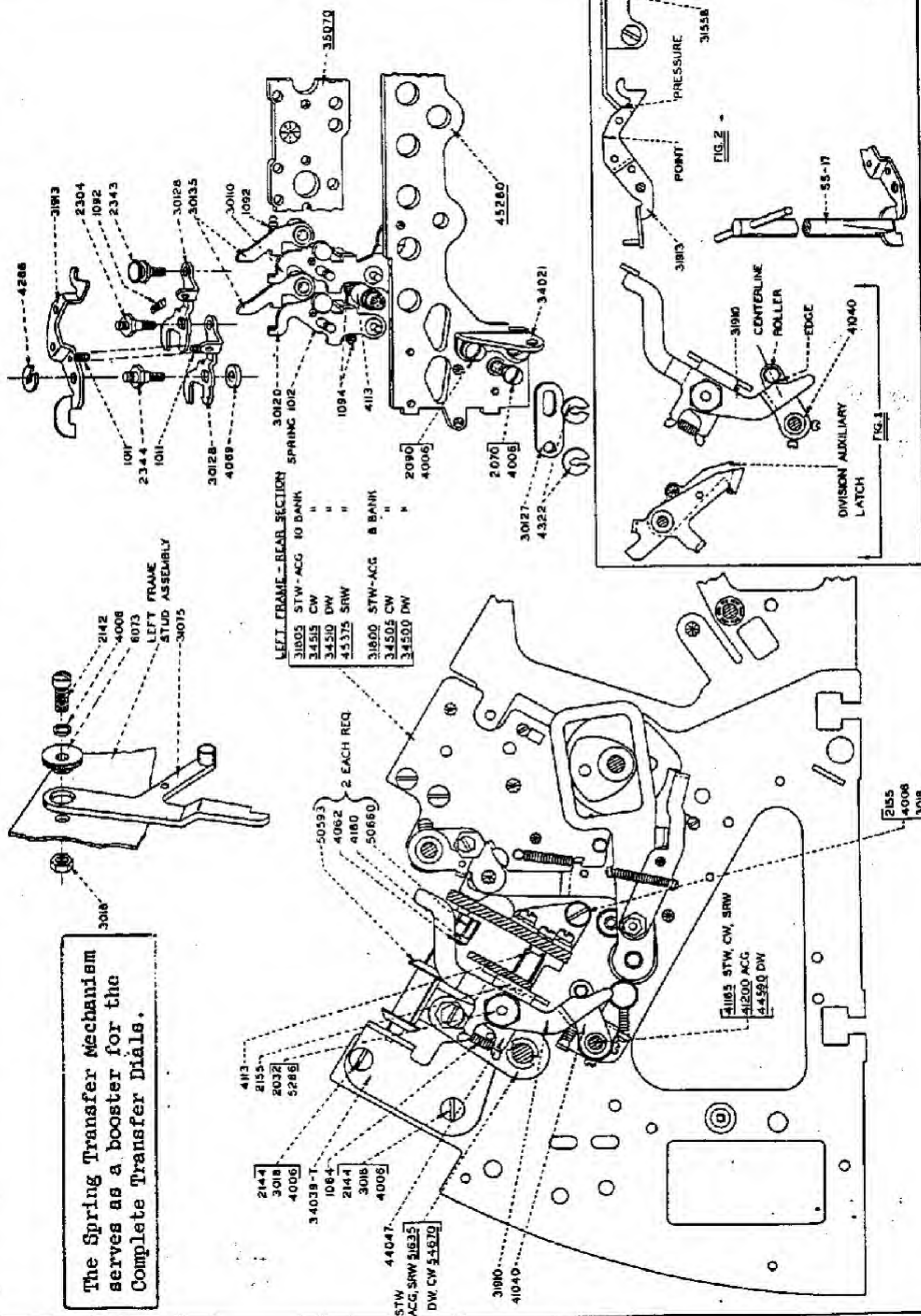
1. If machine has old type #12 Add-Subtract Gear Shaft Assembly 50695, it should be replaced with new type 50795. Old type has brass Add-Subtract Gear and the new type is udylited for identification.
2. Remove Disengaging Arm Assembly 31690 and replace it with 31810, using Spring 1012 to Counter Rocker Arm as shown on page 5.
3. Remove Transfer Blockout 31558 and replace with 31558-1. 31558-1 is shorter and has a sharper form on the left end. Adjustment 5.
4. Remove 41060 Blocking Arm and replace with 41050. Adjustment 6.
5. Remove Shaft 91604-T and replace it with 91604-T-2. When installing Shaft use the same Disabling Bails 91601 & 91602 that were removed. See note.
6. Install 91365, Complete Transfer Disabler Arm.
7. Install 91370, Complete Transfer Bell Blockout. Adjustment 8.
8. Remove Zero Stop Slide 91615 and replace with 91820-T.
9. Remove Bumper 90018 from Bracket 90054.
10. Install 91344 Disabler Bellcrank Actuating Plate.
11. Remove 90553 Zero Stop Lever and replace with 91824.
12. Remove 91695 Carriage Rail Brace Assembly and replace with 91695-2.
13. Install 91340 Disabler Bellcrank. Adjustment 4.
14. Install 91529 Sensing Finger in place of 19th Order Sensing Finger, 91527, and 20th Order Sensing Finger, 91528.
15. Make all adjustments and check machine.

NOTE: New style Accumulator Dials 91350 & 91360, also new style Idler Gear 91614 and new arrangement of Disabling Bails 91602 can not be installed on machines prior to serial no. CW-10-72023, DW-10-271972, STW-10-470170, unless the Carriage Frames are taken apart and the Rear Carriage Frame milled to clear the wider Transfer Gears on the Accumulator Dial Shaft Assemblies. Also 91608 Plate will have to be used in place of 91606. When replacing the individual Accumulator Dial Shaft Assembly be sure to use the correct type.

COMPLETE TRANSFER — 10 BANK
LEFT SIDE FRAME — REAR SECTION

MODEL CW, DW, STW





The Spring Transfer Mechanism serves as a booster for the Complete Transfer Dials.

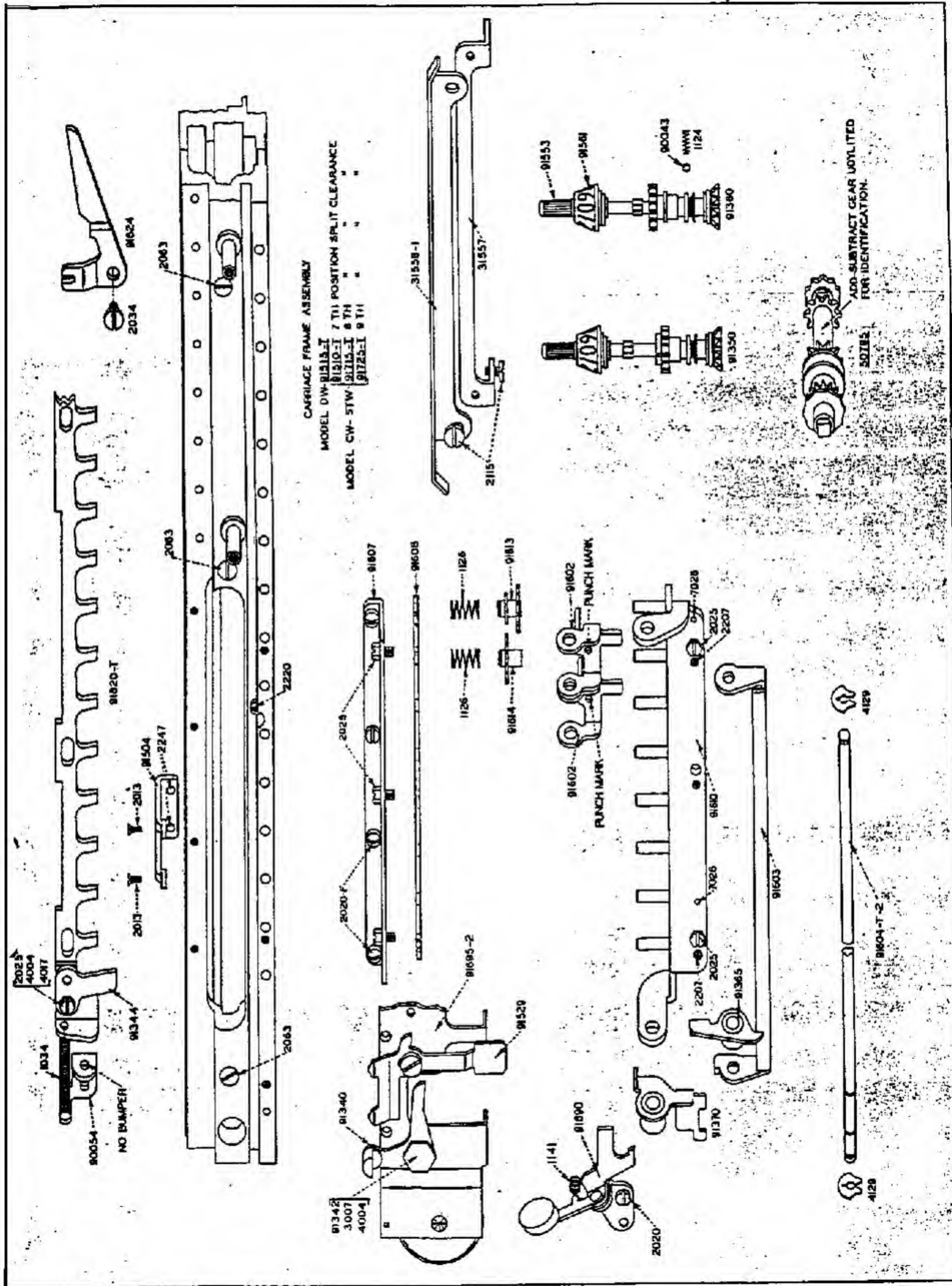
COMPLETE TRANSFER

ADJUSTMENT: Step 1, Fig. 1. (See inset - reverse side) With the Carriage off, depress the Division Keys and cycle the Drive Shaft until the Division Auxiliary Latch is delatched. Adjust 41040 until the Center Line of the Roller is slightly above the Edge of 31910. Step 2, Fig. 2. (See inset - reverse side) With the machine still in Division, form 31913 so it is pressing against 31558. This pressure will cause a slight movement of 31558 and is necessary to insure that 31913 will properly raise the Idler Gears. This prevents a transfer to the left of the position being disabled during Division. The Point of 31913 is to be even or above the surface of 31558.

* **NOTE:** 2142 replaces 2071 and lockwasher 4006 placed on left side of 6073. To prevent screw from contacting 41040.

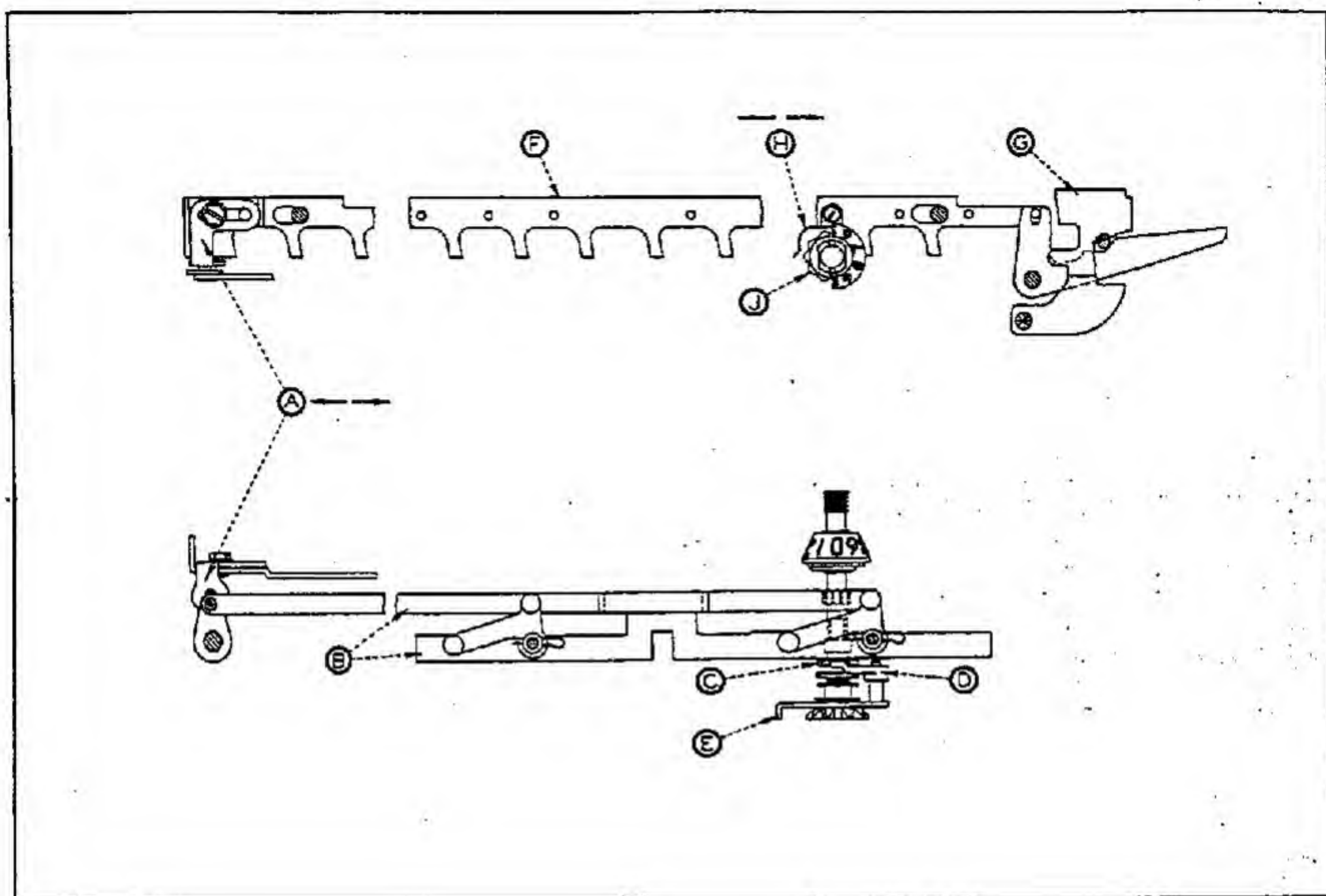
PARTS LIST

1011	Spring	New Usage
1012	Spring	New Usage
1064	Spring	New Usage
1092	Spring	New Usage
1094	Spring	New Usage
2032	4-48 x .218 Special Screw	New Usage
2070	6-40 x 1/4 Fillister Head Screw	New Usage
2090	6-40 x 3/16 Fillister Head Screw	New Usage
*2142	6-40 x 5/16 Fillister Head Screw	Replaces 2071
2144	Special Screw	New Usage
2155	6-40 x .343 Special Screw	New Usage
2304	3-38 x .187 Screw	New Usage
2343	3-38 x .190 Guide Screw	New Part
2344	3-38 x .187 Screw	New Part
3018	6-40 x 1/4" Hex Machine Screw Nut	New Usage
4006	#6 Lockwasher	New Usage
4062	Spring Clip	New Usage
4069	Washer	New Usage
4113	Spacer	New Usage
4180	Spacer	New Usage
4266	Snap Washer	New Usage
4322	Snap Washer	New Usage
5266	Stud	New Usage
6073	Bearing for Power Set Latch	No Change
30110	Spring Transfer Lever Assembly - Right	New Usage
30120	Spring Transfer Lever Assembly - Left	New Usage
30127	Spring Transfer Restore Link	New Usage
30128	Spring Transfer Latch	New Usage
30135	Spring Transfer Centralizer Assembly	New Usage
31075	Power Set Latch Assembly	No Change
31558	Complete Transfer Blockout	No Change
31800	Left Frame - Rear Section STW-ACG 8-Bank	Usage Changed
31805	Left Frame - Rear Section STW-ACG 10-Bank	New Usage
31910	Disengaging Lever Assembly - Full Capacity	New Part
31913	Disengaging Arm - Full Capacity	New Part
34021	Center Bearing Plate Bracket	New Usage
34039-T	Center Bearing Plate Brace Bracket	New Usage
34500	Left Frame - Rear Section DW - 8-Bank	Usage Change
34505	Left Frame - Rear Section CW - 8-Bank	Usage Change
34510	Left Frame - Rear Section DW - 10-Bank	New Usage
34515	Left Frame - Rear Section CW - 10-Bank	New Usage
35070	Bearing and Guide Plate Assembly	New Usage
41040	Complete Transfer Disabling Lever Assembly	Replaces 41050
41185	Bellcrank Lifter Shaft Assembly STW, ACG, SRW	Revised
41200	Bellcrank Lifter Shaft Assembly ACG	Revised
44047	Bell Tapper Lever Bracket	New Usage
44590	Bellcrank Lifter Shaft Assembly DW	Revised
45280	Center Bearing Plate Assembly	Replaces 31555
45375	Left Frame - Rear Section	Replaces 45325
50593	Add - Subtract Gear	New Usage
50660	Transfer Ratchet & Shaft Assembly	New Usage
51635	Add - Subtract Gate Assembly STW, ACG, SRW	No Change
54670	Add - Subtract Gate Assembly DW, CW	No Change



FRIDEN CALCULATING MACHINE CO., INC.
COMPLETE TRANSFER — 10 BANK
PARTS LIST

PART NO	PART NAME	SEE PAGE	PART NO	PART NAME	SEE PAGE
1012	Spring	5	54665	Add-Subtract Gate Assem.	
1034	Spring	6		DW-10, CW-10	5
1124	Spring	6	71208	Eccentric	5
1126	Spring	6	90043	1/8 Ball for Detent	6
1141	Spring	6	90054	Zero Stop Slide Bumper	
2013	2-56 Special Flat Head Screw	6		Bracket-Accumulator	6
2020	4-48 X 3/16 Fillister Head Screw	5-6	90406	Optional Clear Slide Eccentric	5
2020-F	4-48 X 3/16 Special Screw	6	91340	Disabler Bellcrank Assem.	6
2022	4-48 X 1/4 Fillister Head Screw	5	91342	Eccentric Screw for Disabler	
2025	4-48 X .200 Special Hex. Head Screw			Bellcrank	6
	Screw	6	91344	Disabler Bellcrank Actuating	
2034	4-48 Special Screw	6		Plate	6
2063	6-32 X 1 1/8 Flat Head Screw	6	91350	Accumulator Dial Shaft	
2106	Special Screw	5		Assembly. Odd	6
2115	4-48 X 5/32 Special Screw	6	91360	Accumulator Dial Shaft	
2207	4-48 X 1/8 Set Screw	6		Assembly. Even	6
2220	Special Screw	6	91365	Disabler Arm Assembly	6
2247	4-48 X 3/32 Set Screw	6	91370	Bell Blockout Assem.	6
3007	4-48 X 1/4 Hex. Nut	6	91504	Tie Strap for Carriage Frames	6
4000	Snap Washer for .093		91510-T	Carriage Frames Assem.-	
	Diameter Stud.	5		10B.-7th Pos.-CW, STW	6
4004	#4 Lock Washer	5-6	91515-T	Carriage Frames Assem.-	
4006	#6 Lock Washer	5		10B.-DW	6
4017	Washer	6	91529	Sensing Finger (19th & 20th	
4129	Snap Washer	6		Order)	6
7026	Dowel Pin	6	91553	Twirler Knob	6
31557	Complete Transfer Blockout		91561	Accumulator Dial	6
	Bracket	6	91602	Bail for Disabling Idler Gear	6
31558-1	Complete Transfer Blockout	6	91603	Bail for Complete Transfer	
31562	Bearing & Guide Plate Support	5		Blockout	6
31615	Left Side Frame Stud		91604-T-2	Shaft for Transfer Disabling	
	Assembly. STW-10 - OBS.	5		Bails	6
<u>31800</u>	Left Side Frame Stud		91607	Complete Transfer Support	6
	Assembly. STW-10	5	91608	Complete Transfer Plate	6
31810	Disengaging Arm Assem.	5	91610	Idler Gear Bracket Assem.	6
31812	Disengaging Arm-Upper	5	91613	Idler Gear - Lower	6
34130	Left Side Frame Stud		91614	Idler Gear - Upper	6
	Assembly. DW-10 - OBS	5	91690	Bell Tapper Assembly	6
34135	Left Side Frame Stud		91695-2	Carriage Rail Brace Assem.	6
	Assembly. CW-10 - OBS	5	91715-T	Carriage Frames Assem.-	
<u>34500</u>	Left Side Frame Stud			10B.-8th Pos.-CW, STW	6
	Assembly. DW-10	5	91725-T	Carriage Frames Assem.-	
<u>34505</u>	Left Side Frame Stud			10B.-9th Pos.-CW, STW	6
	Assembly. CW-10	5	91820-T	Zero Stop Slide Assem.	6
41050	Disabling Lever Assem.	5	91824	Zero Stop Lever	6
50795	#12 Add-Subtract Gear and				
	Shaft Assembly	6			
51630	Add-Subtract Gate				
	Assembly. STW-10	5			



Slide Half Cent Drive Bracket A as far to the left as the Inner Linkage B will allow. This positions the Transfer Cam C for each 1/2-¢ Dial in the fullest engagement with the 1/2-¢ Transfer Arm D. With thumb held against the Transfer Lever E and 1/2-¢ set in the Dial, twirl from 9 to 0 to see if a transfer is being made. Movement of the Zero Stop Slide F disables the transfer, so with the thumb still in place, clear out the Dial to a 5 from 0. The transfer which should normally occur when the Dial moves from 0 to 9 is disabled by the Clear Mechanism. If a transfer is still being made, slide Drive Bracket A slightly to the right, or check movement of the Zero Stop Slide F to see that it picks up as soon as the Optional Clear Slide G starts to move.

Set Detent Spring H so that when the Clear Racks are pulled out by pulling the Optional Clear Slide there will be a positive detent action against the 1/2-¢ Accumulator Dial. When Clear Racks are released, Detent Spring should not touch the Dial Detent Wheel J.

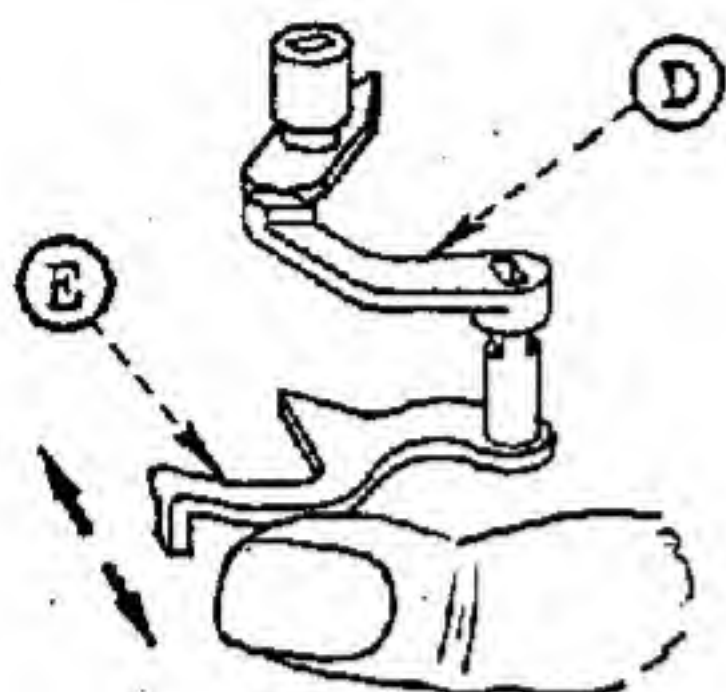


FIG. 1: Pull Transfer Lever E part way out of Transfer Arm D and form in direction shown to obtain settings shown in Figures 2 and 3.

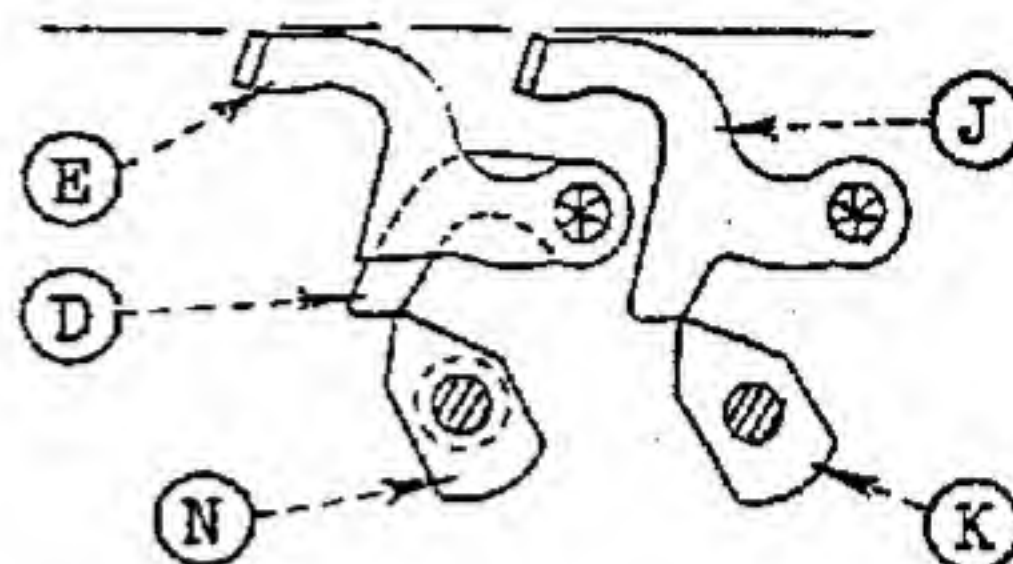


FIG. 3: With Transfer Cams K and N on high point as shown, the Lips of Transfer Levers E and J should throw the same. Adjust as shown in Figure 1.

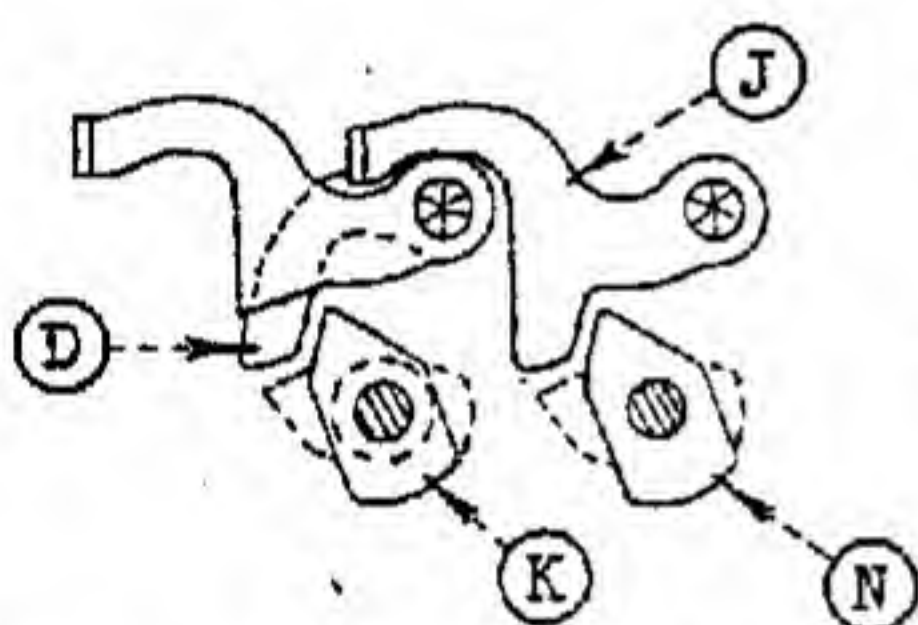


FIG. 2: There should be the same clearance between Transfer Cam N and Transfer Lever J as there is between Cam K and Transfer Arm D. Adjust as shown in Figure 1.

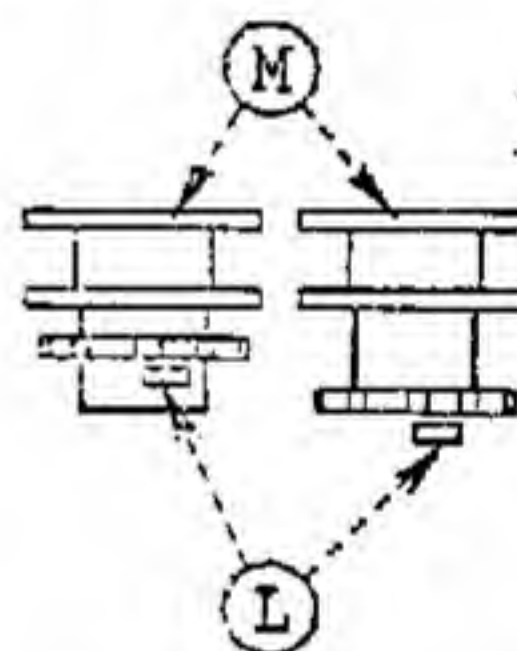


FIG. 4: Check Transfer Teeth L on the Actuators. Adjust so they are close to Transfer Gears M.

Additional check for Transfer Action. Ref; Service Letter 225.

Place all 9's in Keyboard. With Add Key up, depress Plus Key once. Turn all three Clear Knobs to non-clearing position. Place "1" in Multiplier Unit. Pull Repeat Key down. Depress Multiplier Key, then Negative Multiplier Key. The first and last Dials with numbers should change. Others show 9's. If incorrect, check as shown above and also Springs 1040 and 1006 per Service Letter 225.

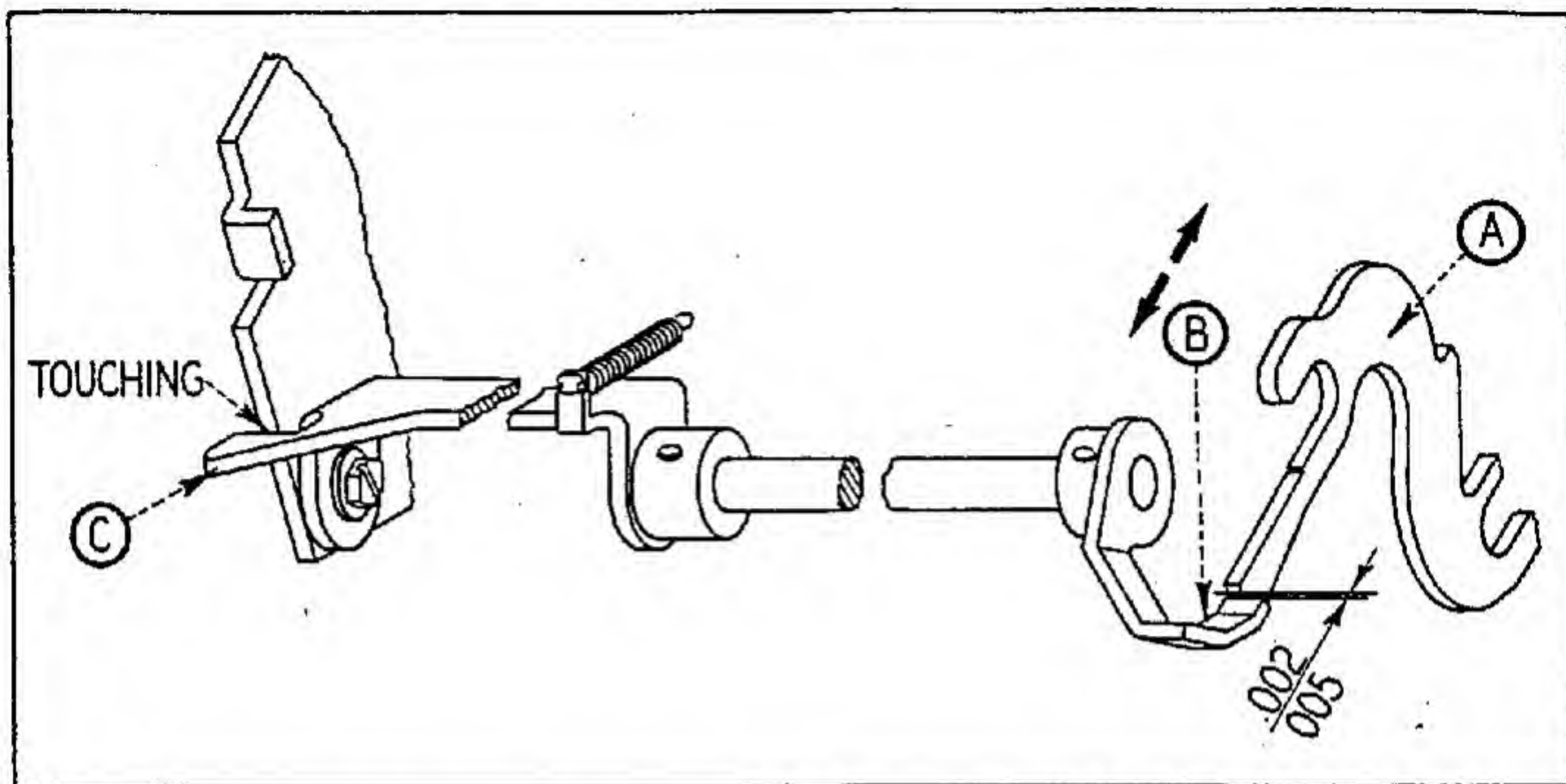
INSERT IN YOUR SERVICE MANUAL FACING PAGE 1
OF THE AUTOMATIC HALF CENT SUPPLEMENT.

PARTS LIST

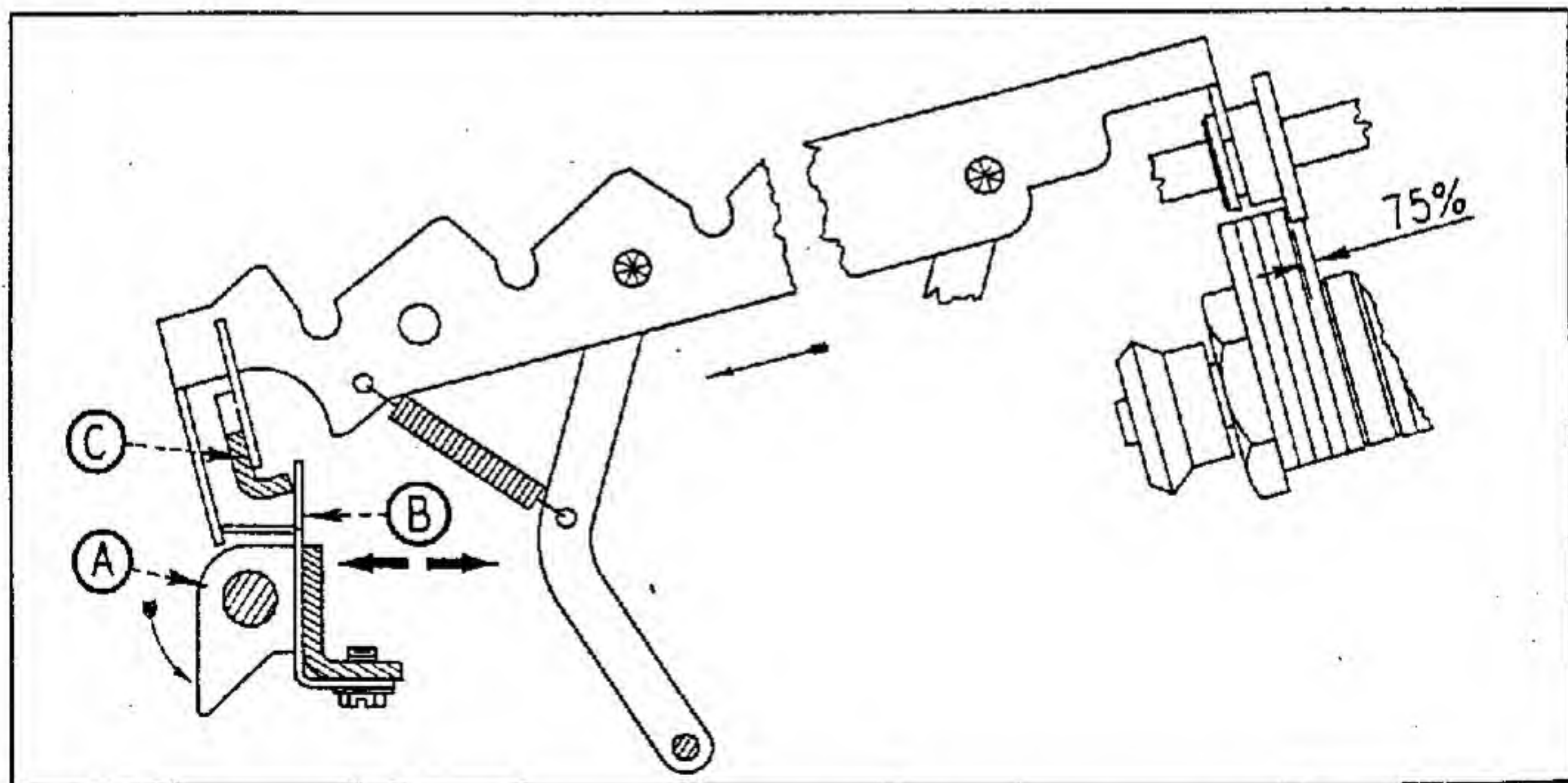
PART NO.	PART NAME
1102	Spring - 8 Bank.
1136	Spring
2012	2-56 x 1/8" Fillister Head Screw.
2025	4-48 x .200 Special Hex Head Screw.
2030	4-48 x 1/4 Special Screw.
2063	6-32 x 1 1/8" Flat Head Screw.
4004	#4 Lock Washer.
4017	Washer.
4045	Spacer - 8 Bank.
4188	Washer.
4205	Washer.
31077	Stop for Power Set Latch Release - 8 Bank.
<u>91810</u>	1/2-¢ Carriage Frame Assembly - 8 Bank - CW-STW Models.
<u>91810-T</u>	1/2-¢ Carriage Frame Assembly - 10 Bank - CW-STW Models.
91814	1/2-¢ Accumulator Clear Rack Retainer.
91820	1/2-¢ Zero Stop Slide - Accumulator - 8 Bank.
91820-T	1/2-¢ Zero Stop Slide - Accumulator - 10 Bank.
91822	1/2-¢ Drive Bracket - 10 Bank.
91823	1/2-¢ Drive Bracket - 8 Bank.
91824	1/2-¢ Zero Stop Lever.
91828	Spacer for 1/2-¢ Carriage frame assembly.
91829	Bushing for Pivot Arm.
91830	1/2-¢ Cam Slide & Tie Bar Assembly - 10 Bank.
91838	1/2-¢ Cam Slide Clip.
91840	1/2-¢ Cam Slide & Tie Bar Assembly - 8 Bank.
91845	1/2-¢ Transfer Lever.
91848	1/2-¢ Transfer Arm.
<u>91850</u>	1/2-¢ Accumulator Dial Shaft Assembly - Odd.
91851	1/2-¢ Accumulator Dial Only.
91853	1/2-¢ Holding Spring.
<u>91860</u>	1/2-¢ Accumulator Dial Shaft Assembly - Even.
91875	1/2-¢ Optional Clear Slide Assembly.
<u>91880</u>	Accumulator Dial Shaft Assembly - Special - Odd.
<u>91890</u>	Accumulator Dial Shaft Assembly - Special - Even.
<u>94415</u>	1/2-¢ Carriage Frame Assembly - 8 Bank - DW Model.
<u>94415-T</u>	1/2-¢ Carriage Frame Assembly - 10 Bank - DW Model.

FRIDEN CALCULATING MACHINE CO., INC.
 AUTOMATIC TRANSFER MECHANISM
 (REVISED 9-12-52)

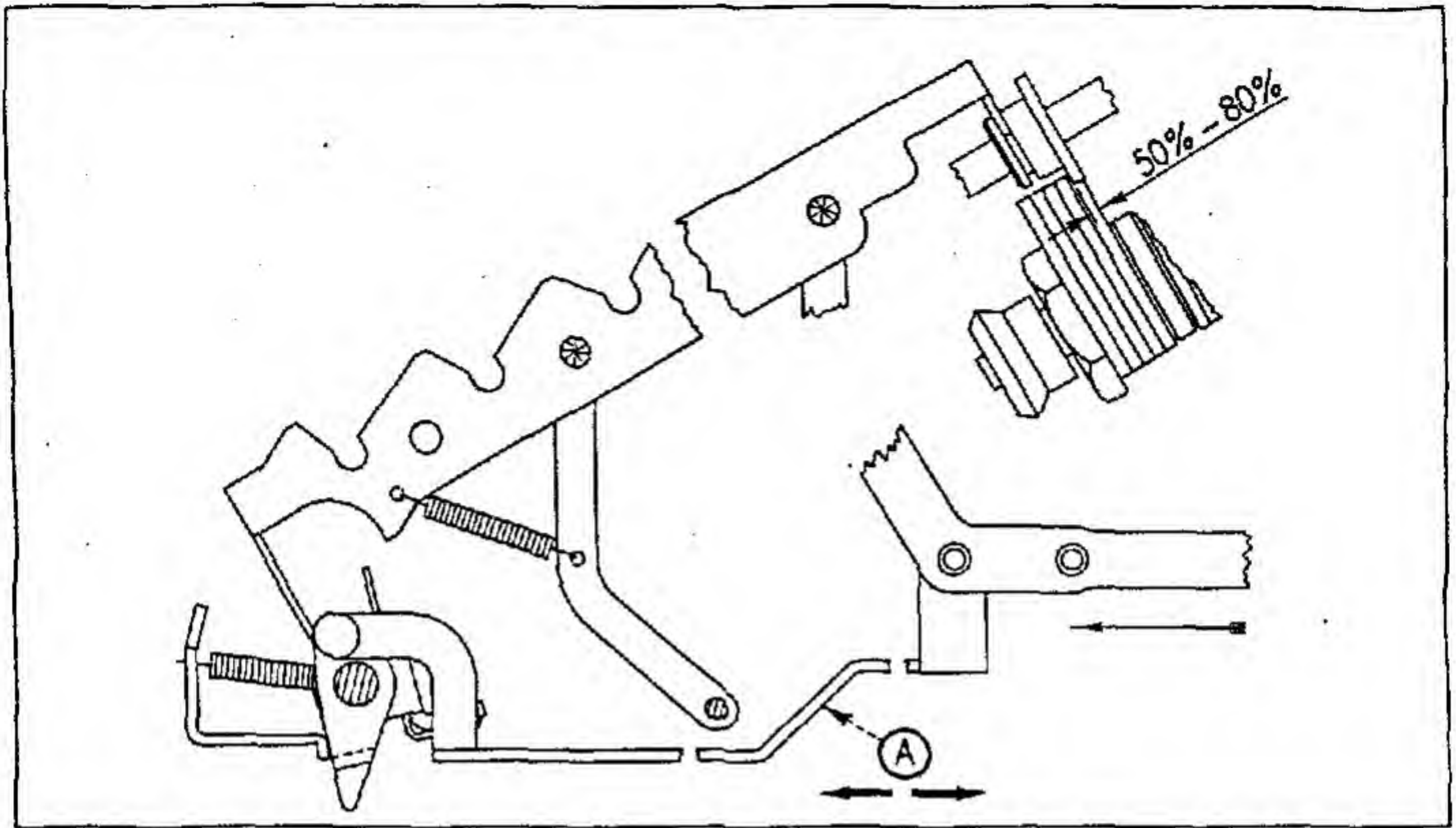
MODEL STW-ACG



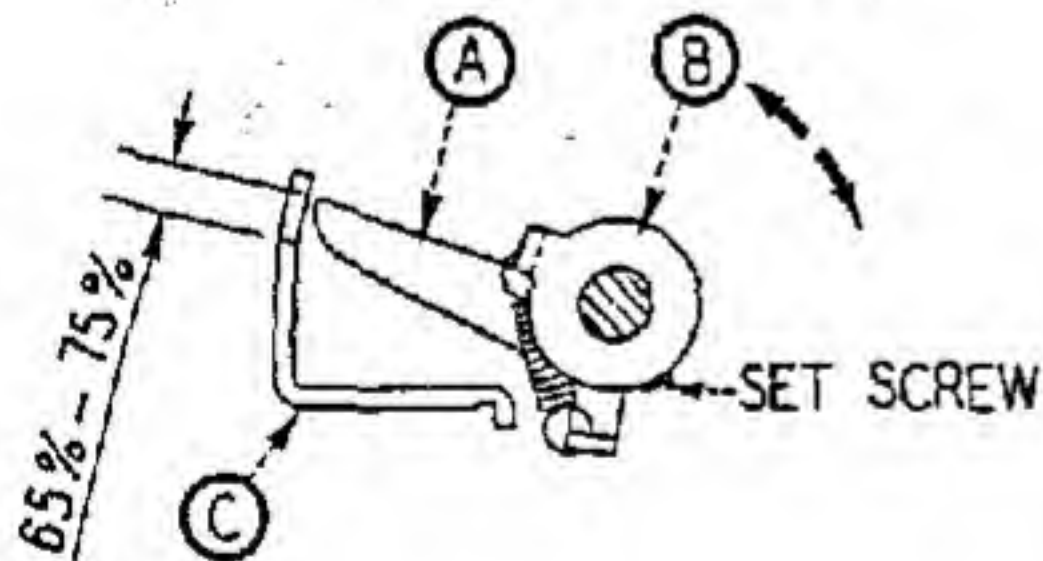
1. TRANSFER ACTUATOR ASSEMBLY FOR DIVISION STARTING SLIDE: With Machine in Home Position and Transfer Setting Bail C touching Left Side Frame, there should be .002 to .005 clearance between Division Starting Slide A and Transfer Actuator B. Adjust by forming Transfer Actuator B at point indicated by arrow. Reason for this adjustment: If not enough clearance it would hold the Division Starting Slide to the rear. If wide it would effect adjustment #4.



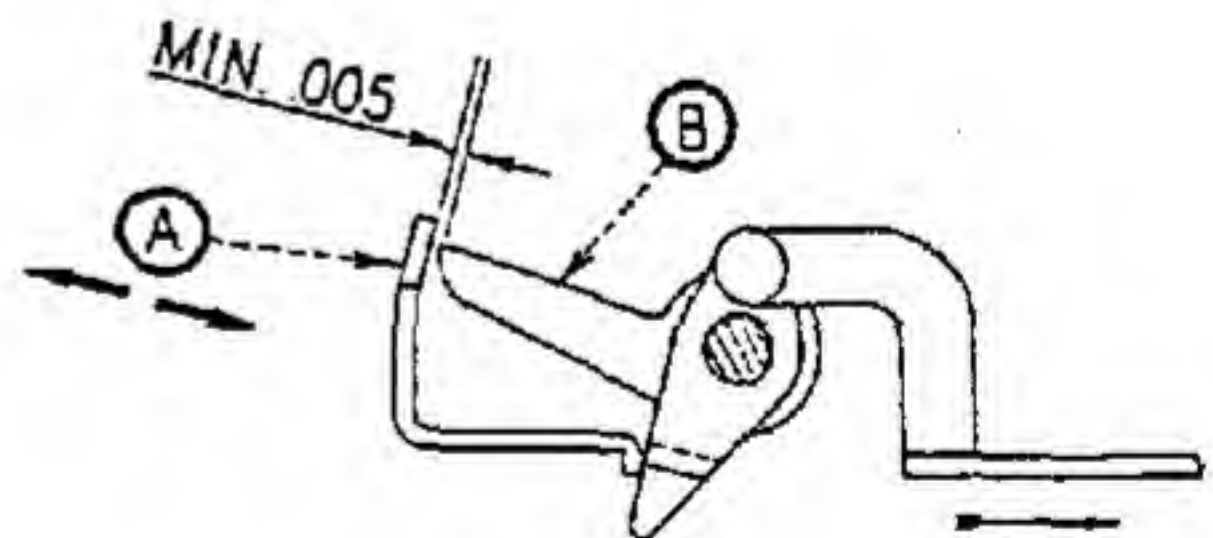
2. TRANSFER SELECTING FINGER: Pull Selection Gear back by rocking Bail A. Form Transfer Selecting Finger at B to stop on Brace C when Selection Gear has 75% engagement with #1 Actuator Segment. Reason for adjustment: To provide a limit of travel of the Selection Lever upon depression of the Transfer Keys.



3. TRANSFER RESTORE LEVER: Depress Transfer Keys and crank Machine 1/4 cycle. Selection Gear must have 50% to 80% engagement with #1 Actuator Segment. Adjust by forming Lever A at point indicated by arrow. This setting is not to be confused with the standard adjustment of Selection Gears.

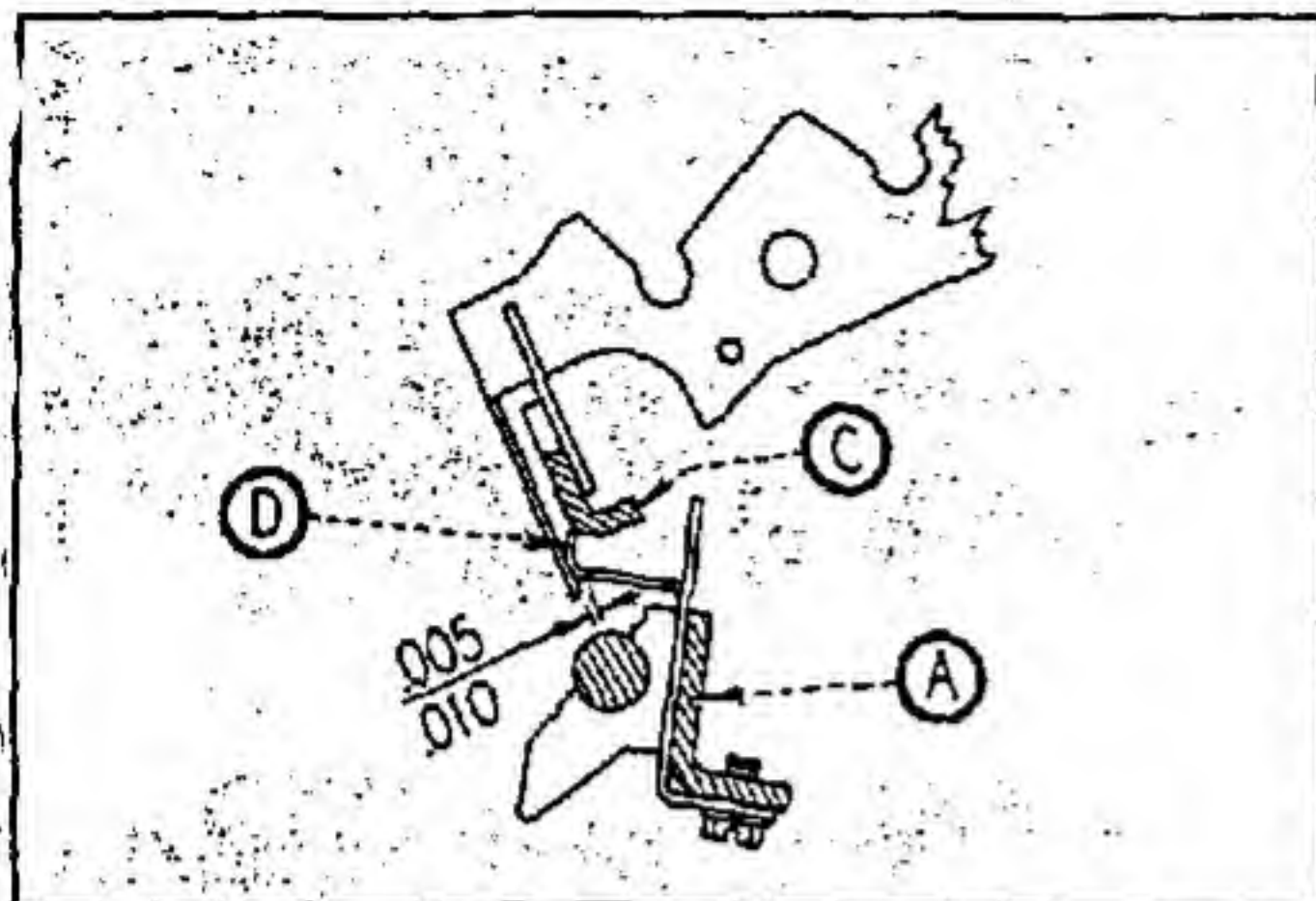


4. TRANSFER RELEASE LEVER: Adjust Release Lever A, By rotating Live Point B on Shaft, to have 65% to 75% latch on Blocking Tail of Transfer Latch C. To Check, put machine in Division and tap the Transfer Keys. Latch should not drop off.

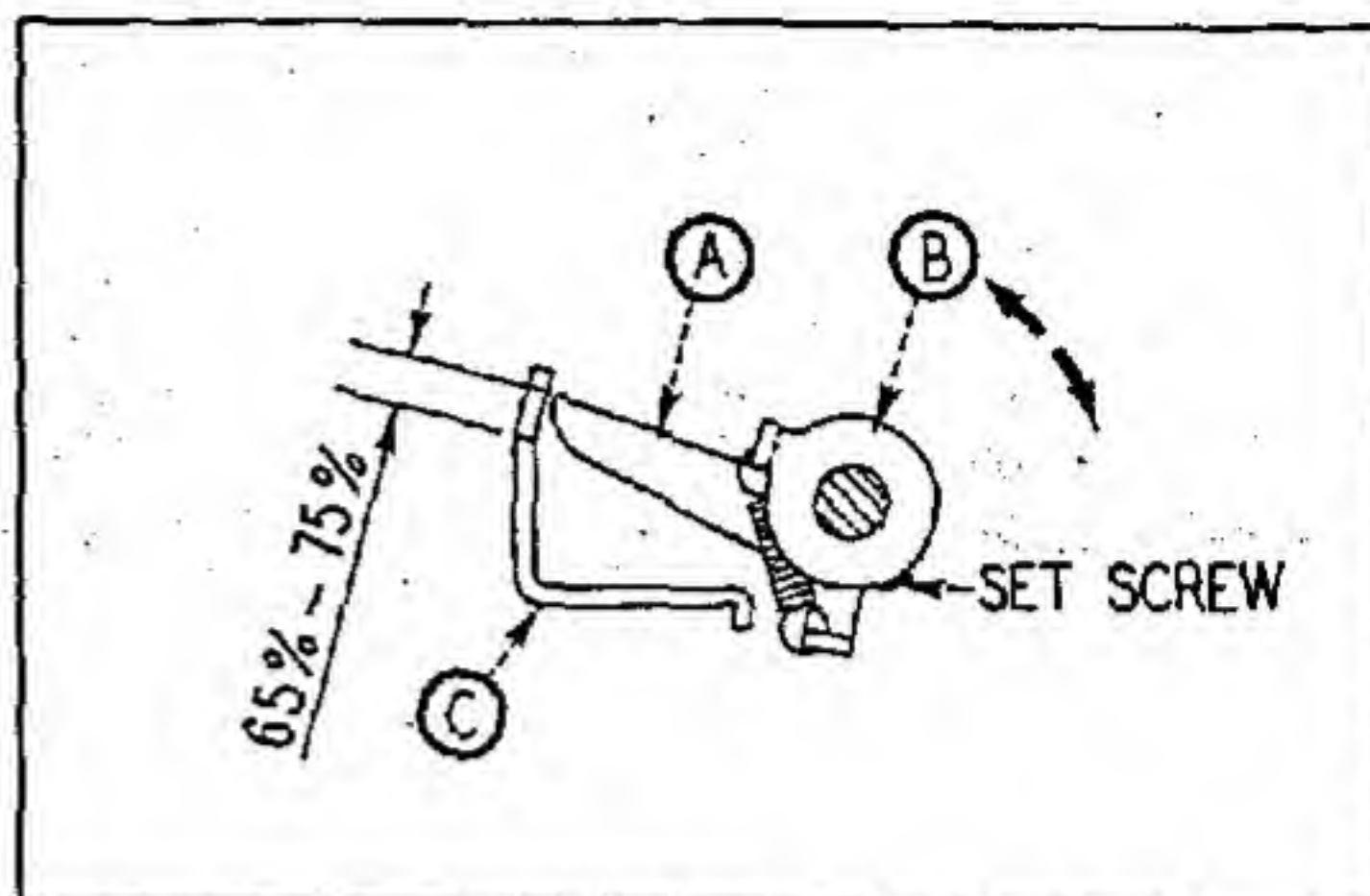


5. TRANSFER LATCH: In Home Position there should be a minimum of .005 clearance between Transfer Latch A and Transfer Release Lever B. To adjust, form Transfer Latch Blocking Tail A at point indicated by arrow.

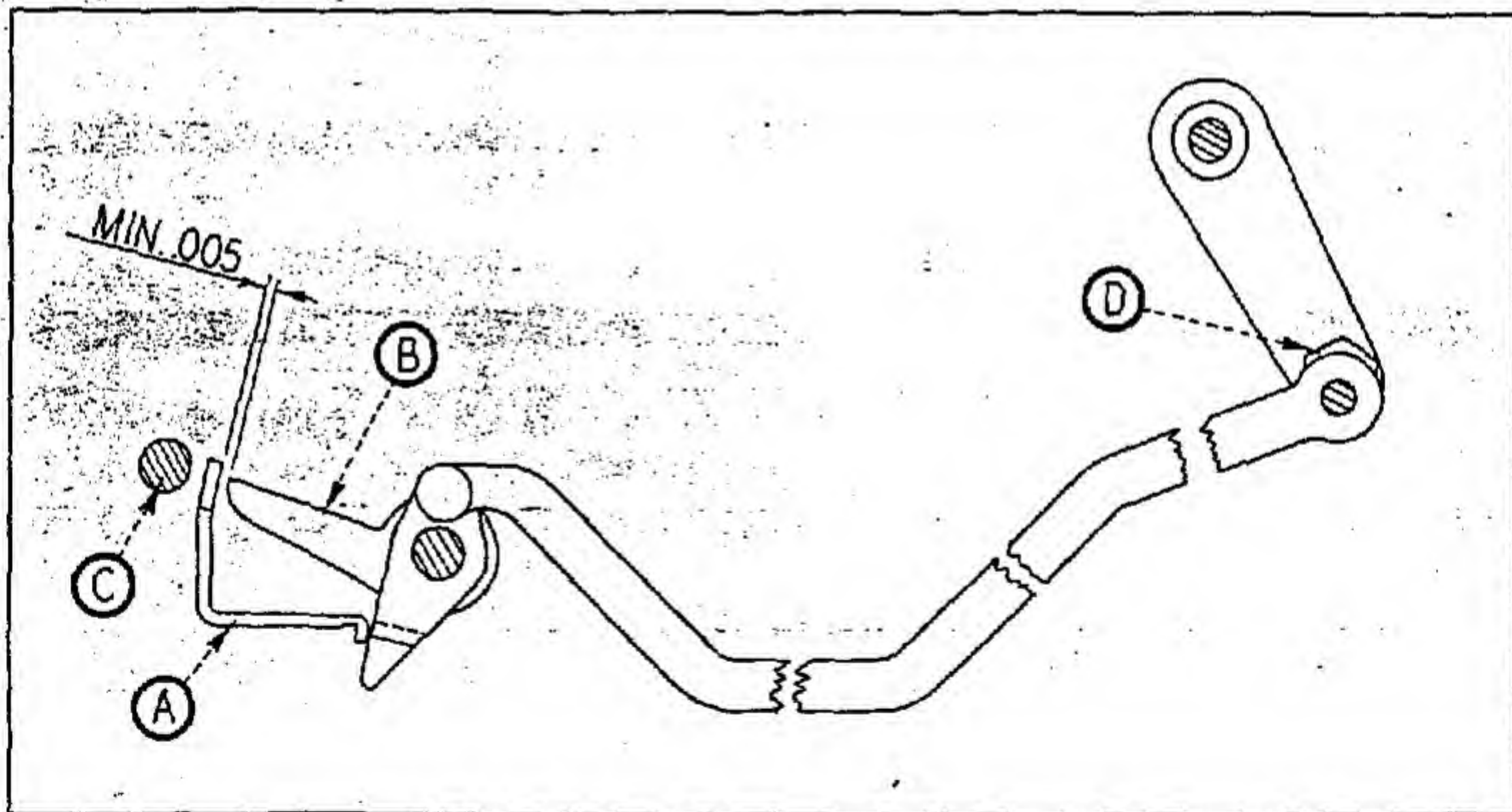
MODEL STW-ACC

AUTOMATIC TRANSFER MECHANISM
(REVISED 9-12-52)

3. TRANSFER SELECTING FINGER: With Bail A in neutral position there should be .005 to .010 clearance between lip on Selection Lever and Selecting Finger. Adjust by forming Lip D to stop against Brace C.

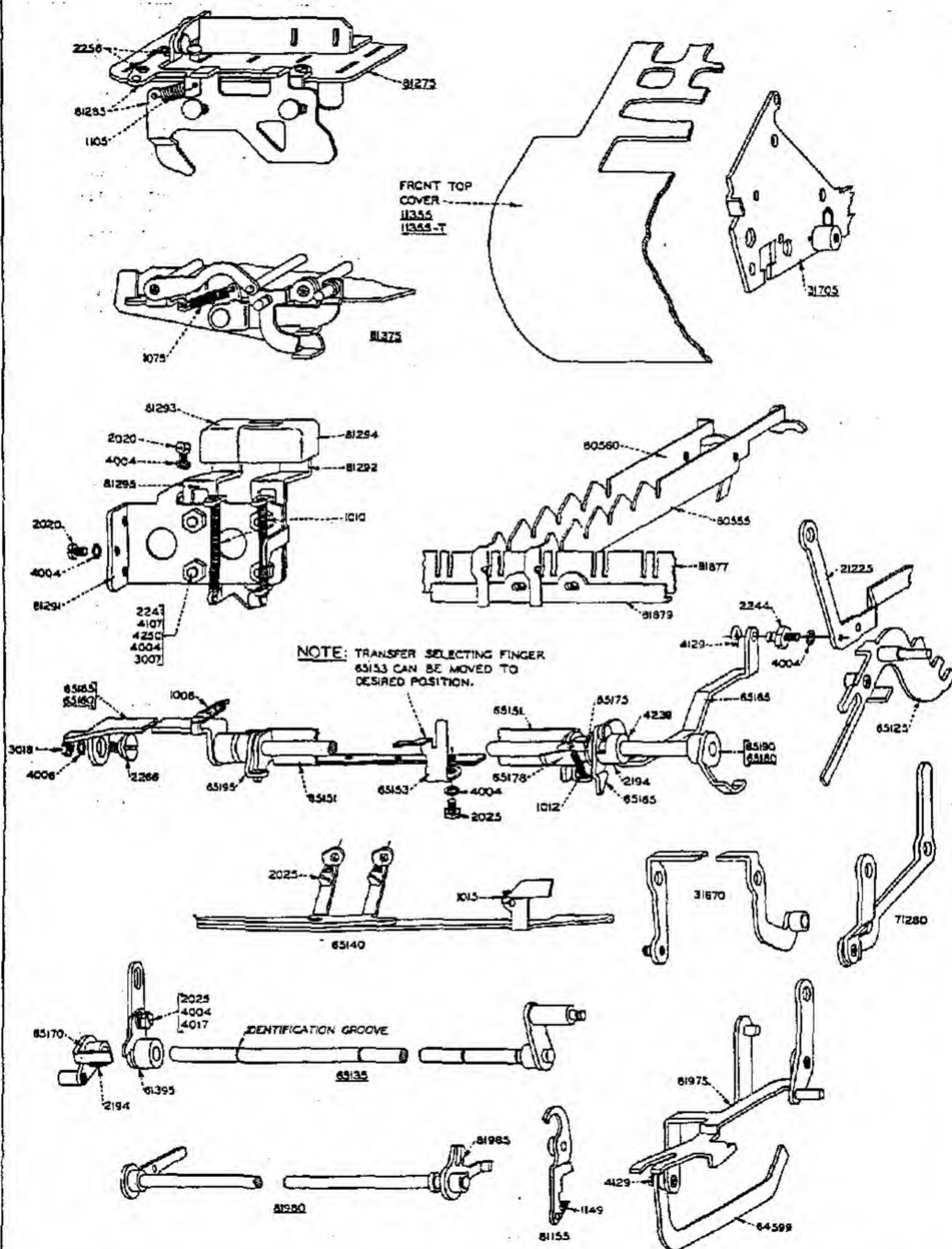


4. TRANSFER RELEASE LEVER: Adjust Release Lever A, by rotating Live Point B on Shaft, to have 65% to 75% latch on Blocking Tail of Transfer Latch C. To Check, put machine in Division and tap the Transfer Keys. Latch should not drop off.

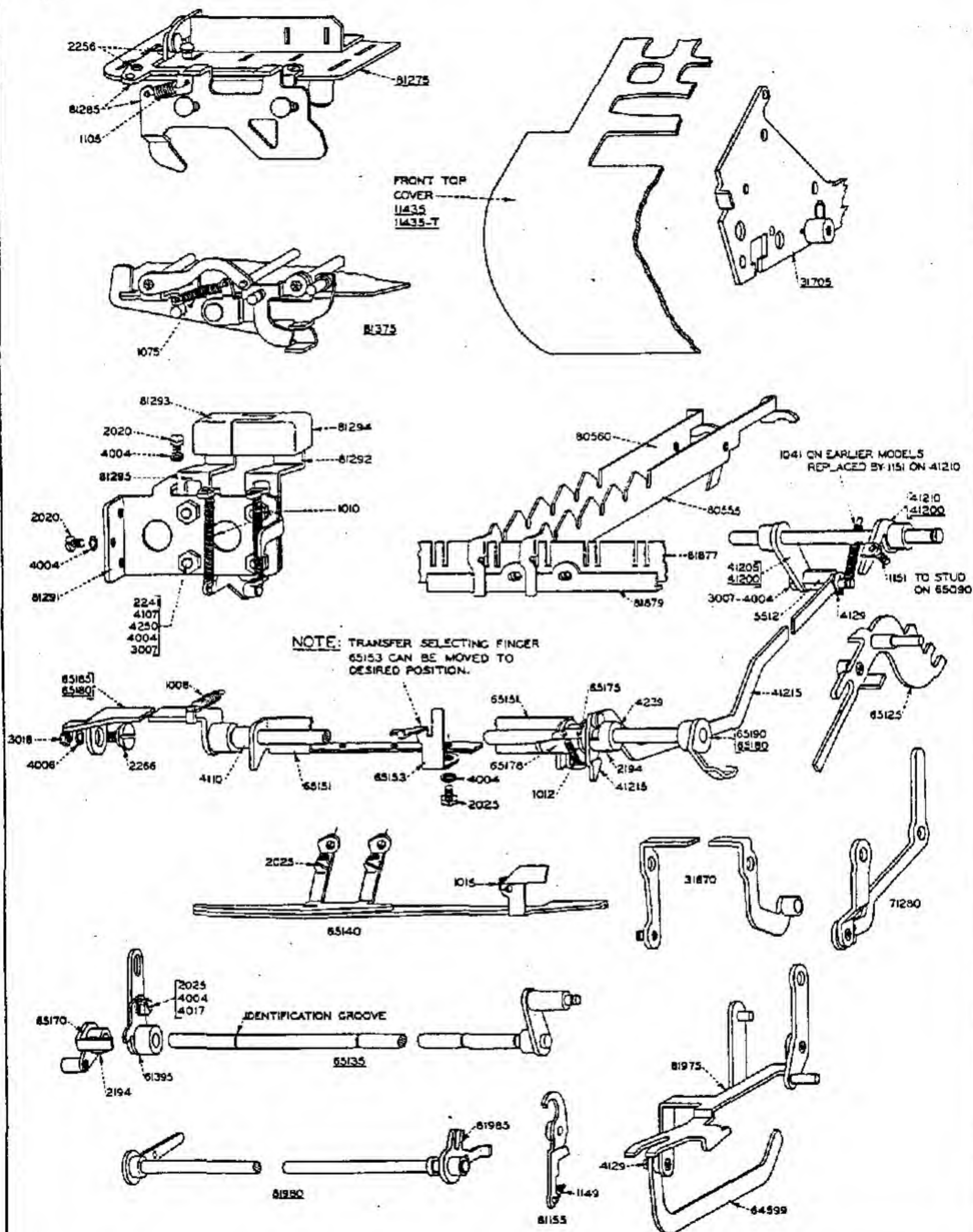


5. TRANSFER LATCH: In Home Position, Transfer Latch A must not touch Keyboard Clear Gate Shaft C and should have a minimum of .005 clearance between Transfer Latch A and Transfer Release Lever B. Adjust by Eccentric D on Bellcrank Lifter Shaft Assembly.

FRIDEN CALCULATING MACHINE CO., INC.
AUTOMATIC TRANSFER MECHANISM



FRIDEN CALCULATING MACHINE CO., INC.
AUTOMATIC TRANSFER MECHANISM
(REVISED 9-12-52)



MODEL STW-ACC

AUTOMATIC TRANSFER MECHANISM (Revised 9-12-52)

PARTS LIST

PART NO	PART NAME	
1008	Spring	New Usage
1010	Spring	New Usage
1012	Spring	New Usage
1015	Spring	New Usage
1075	Spring	Replaces 1073
1041	Spring	Temporary
1103	Spring	New Usage
1149	Spring	New
1151	Spring	New Usage
2020	4-48 x 3/16" Fillister Head Screw	New Usage
2025	4-48 x .200 Special Hex Head Screw	New Usage
2194	6-40 x 1/8" Set Screw	New Usage
2241	4-48 Special Screw	New
2256	4-48 x 1/8" Special Flat Head Screw	New
2266	6-40 Special Screw	New
3007	4-48 x 1/4" Hex Nut	New Usage
3018	6-40 x 1/4" Hex Nut	New Usage
4004	#4 Lock Washer	New Usage
4006	#6 Lock Washer	New Usage
4017	Washer	New Usage
4107	Roller	New Usage
4110	Spacer	Replaces 65195
4129	Snap Washer	New Usage
4239	Collar for Transfer Restore Lever Assembly	New
4250	Spacer	New
5512	Eccentric Adjusting Stud	New
11435	Front Top Cover Assembly - 8 Bank	Replaces 11355
11435-T	Front Top Cover Assembly - 10 Bank	Replaces 11355-T
21220	Switch Control Lever Assembly - Transfer	Replaces 21225
31670	Add-Subt. Gate Control Bail Assembly	Replaces 31660
31705	Left Side Frame Stud Assembly	Replaces 31610
41200	Bellcrank Lifter Shaft Assembly	Replaces 41185
41205	Transfer Latch Disabling Arm Assembly	New
41210	Bellcrank Lifter Pawl Assembly	Replaces 40030
41215	Transfer Restore Lever Assembly	Replaces 65165
61395	Adjustable Counter Reverse Interlock Lever Assembly	Replaces 61382
64599	Plus-Minus Gate Control Lever Link	Replaces 64597
65125	Division Starting Slide Assembly - Transfer	Replaces 65130
65135	Counter Reverse Actuating Shaft Assembly	Replaces 61380
65140	Transfer Latch Assembly	New
65151	Transfer Selection Bail	New
65153	Transfer Selecting Finger	New
65170	Positive Transfer Counter Reverse Actuator Lever Assembly	New
65175	Live Point Assembly for Transfer Release Lever	New
65178	Transfer Release Lever	New
65180	Transfer Shaft Assembly	New
65181	Transfer Shaft	
65185	Transfer Setting Bail Assembly	
65190	Transfer Actuator Assembly for Division Slide	
7073	6/0 x 3/8" Taper Pin	
65185	Transfer Setting Bail Assembly	New
65190	Transfer Actuator Assembly for Division Slide	New
71290	Return Clear Actuating Lever Assembly (Front)	Revised
80555	Selecting Arm Assembly (Short- Rear)	Replaces 80515
80560	Selecting Arm Assembly (Short- Front)	Replaces 80520
81155	Keyboard Clear Block Release Lever Assembly	Replaces 81150
81275	Top Plate Assembly- Multiplier Keyboard	Replaces 81270
81285	Transfer Keys Interlock Assembly	New
81291	Transfer Keys Supporting Bracket	New
81292	Transfer Key- Positive	New
81293	Transfer Key Top- Negative	New
81294	Transfer Key Top- Positive	New
81295	Transfer Key Assembly- Negative	New
81375	Bottom Plate Assembly	Replaces 81245
81877	Selecting Arm Guide	Revised
81879	Selecting Arm Guide Support	Revised
81975	Keyboard Lock Actuating Slide Assembly	Replaces 81875
81980	Keyboard Clear Disabling Levers & Shaft Assembly	Replaces 81135
81145	Keyboard Clear Disabling Lever Assembly	
81985	Keyboard Clear Disabling Bellcrank Assembly	
7072	6/0 x 11/32" Taper Pin	
81985	Keyboard Clear Disabling Bellcrank Assembly	Replaces 81140